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Electrical World

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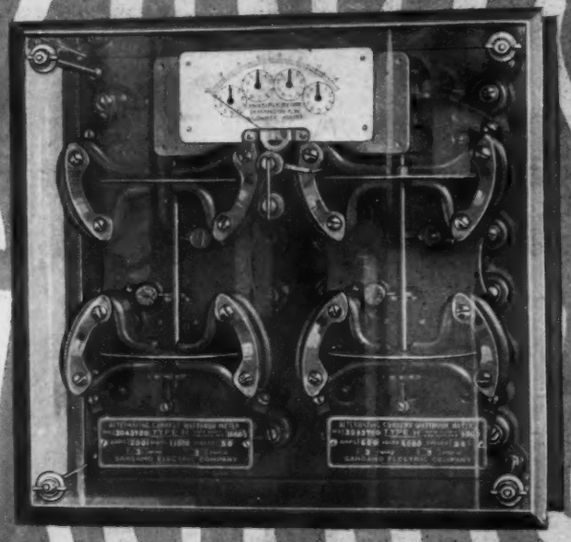
SANGAMO



Sangamo double polyphase meter equipped with differentially geared maximum-demand register. Used for summation of energy consumption and for determining total maximum demand of two circuits.

Sangamo Double Polyphase Meter for energy summation or load analysis

THE Sangamo double polyphase meter was originally designed to enable a prominent central station to measure the interchange of power in a transmission circuit where the available switchboard space was limited. Consisting of two vertical polyphase meters on a single base, the design is readily adaptable to additional uses—measurement of power in separate circuits or for the determination of the energy and reactive components in a single circuit.

Each polyphase element may be fitted with a standard register for measurement of energy in separate circuits and, if desired, the registers may be equipped with detents thus obtaining measurement in and out on interchange of power.

For purposes of load analysis, one of the polyphase elements can be internally connected to measure reactive component.

In any of these arrangements the type HMP demand attachment can be substituted for the standard register thus indicating the maximum demand in separate circuits, or energy and reactive component demands in the same circuit.

The polyphase elements are so mounted that a single differential register of the type used on Sangamo horizontal polyphase meters may be installed. This permits the summation of energy in two separate circuits on a single register. By using a type HMP demand attachment the maximum demand of the two circuits may be obtained.

When separate circuits are being metered they need not be of the same rating in volts, amperes, or cycles.

The development of the double polyphase meter is additional evidence of the progressive Sangamo policy in the contribution of new and useful metering devices for the central station industry.

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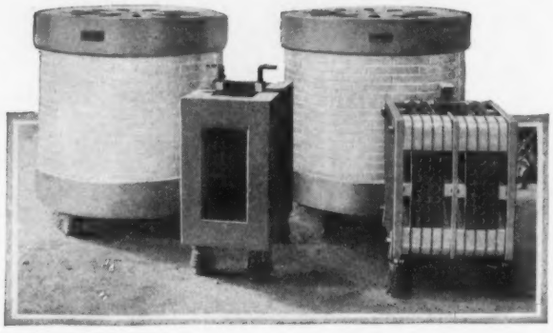

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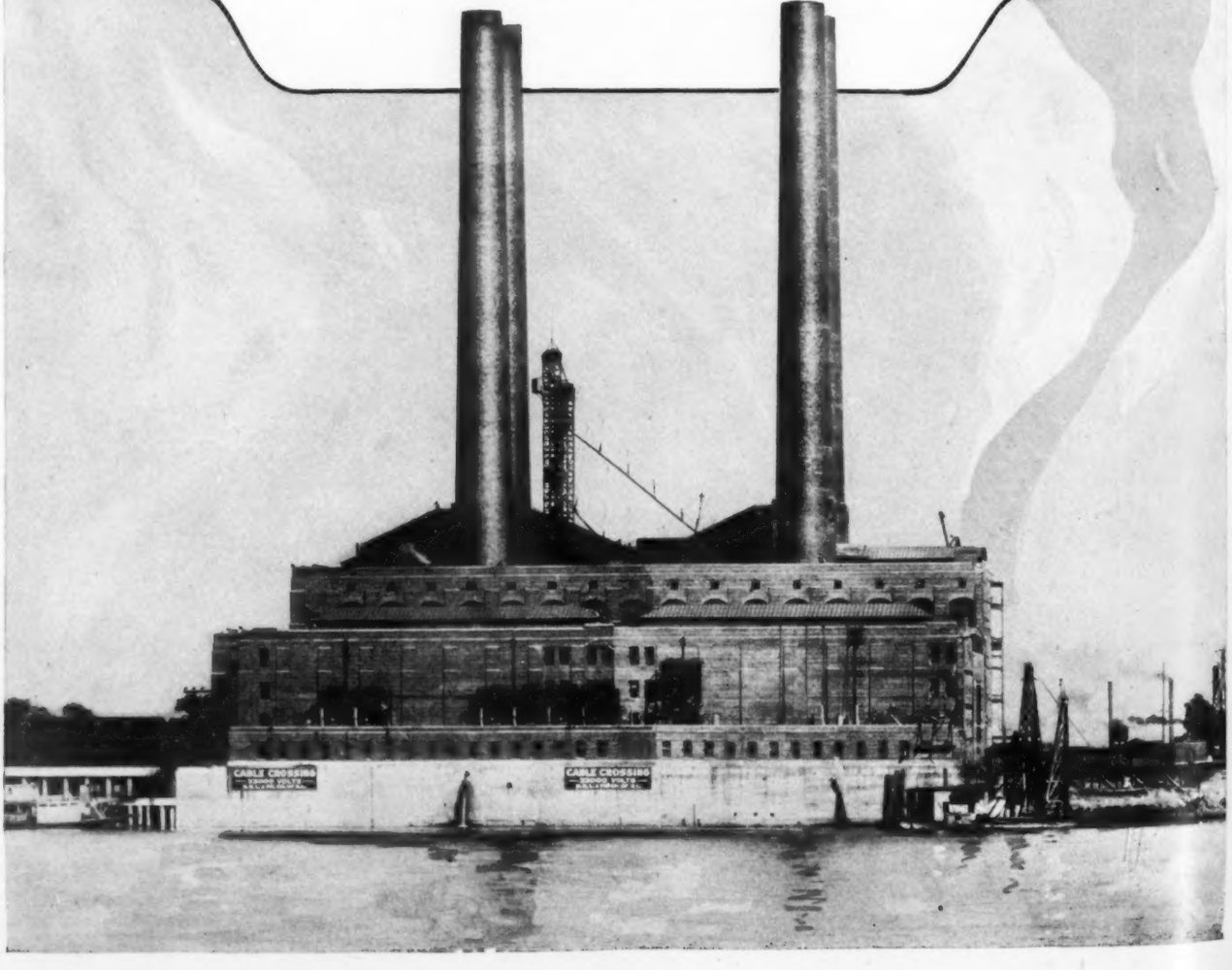

Electrical World

THE CONSOLIDATION OF ELECTRICAL WORLD, ELECTRICAL ENGINEER AND AMERICAN ELECTRICIAN

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W. H. ONKEN, JR.

Editor

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Co-operation in Electrification

SOME new and valuable policies were announced by railroad officials and electrical manufacturers at a recent A. I. E. E. electrification meeting in New York. These covered standardization, power supply and policy in solving electrification problems. Secretary Hoover and Messrs. Herr of the Westinghouse company, Swope of the General Electric, Cary of the New York Central Railroad, Markham of the Illinois Central and others agreed that standardization should be sought in electrification if transportation facilities are to be improved. Interchangeable equipment and standardization in voltage, frequency and method of contact were indicated as desirable moves, and all were of opinion that power should be purchased from the big interconnected light and power systems.

The most encouraging announcement, however, was made by Messrs. Herr and Swope in pledging the co-operation of their organizations in carrying out the principles of standardization and simplification. Each company announced its readiness to build any system desired by the railroads. As pointed out by Mr. Cary, real progress is indicated if the electrical specialists will study individual electrification projects and agree upon an answer. Then the railroad officials, who are not specialists, can go forward on the sound basis of undisputed technical advice.

Indications point to very rapid progress in terminal and trunk-line electrification, and it is encouraging indeed to find all interested in accord upon a fundamental plan for developing national systems with this end in view.

Good-Will Value in New Plant Construction

TO OVERLOOK the good-will value of an adequate announcement of new plant construction is to miss an opportunity to create much favorable public opinion in central-station territory served by an expanding property. We emphasize adequacy because most companies today take pains to inform the public of decisions to build new stations before ground is broken, but often such announcements fall short of full accomplishment for the reason that the bare facts of plant size and cost are not "tied into" the public relations structure of the company with any real effectiveness.

An admirable illustration of a first-class piece of new plant publicity appeared in the New York *Times* for May 25 in the shape of a front-page "story" announcing the coming of the new East River station of the New York Edison Company. This news appeared elsewhere in the press as a matter of general interest, but the locally printed story in New York covered certain angles of the subject that could well be considered by central-station managers in other places in preparing announcements of their own developments. In addition to the customary information about the size, cost, expected date of operation, number of units, fuel and water requirements, award of contracts for machinery, etc., a number of comparisons of popular interest were included which helped the layman to visualize the project in terms of local benefit and justifiable pride.

Thus it was pointed out that not a single pound of coal or ashes will be hauled through the streets as a result of the plant's operation, although five hundred or more trucks would be required for this service if the designers had not provided for water-borne carriage. The plant's demand for condensing water will be double the flow of the Catskill Aqueduct supply to New York, but emphasis was laid upon the borrowing of the salt water of the East River (instead of using fresh water) for this purpose, with its speedy return. Again, a comparison of the concentrated power of the company's stations with all the horses in American cities showed that the electrical resources of the organization would overcome this animal power were a tug-of-war possible, and that these plants will be capable of generating as much energy as France produced last year, France being considered the best-lighted country in Europe.

Such methods of expressing the scope of a plant development can easily be adapted to local situations, using the yardsticks of local measurement to make clear the magnitude of even small-company projects. The translation of plant ratings into homely terms, the appeal to honest local pride in the erection of a valuable structure planned to serve a growing community in future decades, the pointing out in comprehensible terms of noteworthy advances in engineering—these are a few of the ways in which popular interest and good will can be enhanced in announcing steps in central-station development which legitimately appeal to all supporters of progress.

Danger of Speculative Transfers in a Regulated Business

UNPRECEDENTED activity in the purchase, transfer and consolidation of public service properties throughout the country has resulted in prices being asked for some properties above their physical valuation. Oftentimes these prices have been paid because the property was needed for strategic reasons in some interconnection project that would benefit the public, or because the purchaser contemplated effecting economies of operation that would permit greater net earnings at existing or even reduced rates. However, transactions predicated on possible net earnings may lead to an endless series of transfers and consolidations, each successive purchaser expecting still further to increase economies and net earnings.

While such reasons would warrant and justify paying high prices for properties used in ordinary business, it must not be forgotten that the utility business is regulated and that rates in a majority of states are

based primarily on physical valuation without much consideration of going value, management or other intangibles. If rates are normal and there is no political agitation for unwarranted reductions, a company which has purchased properties at a stiff price may not suffer any evil consequences until a valuation is demanded, when in any readjustment of schedules such a company may have to make reductions in rates, however low the previous rates may have been. This possibility alone should cause a management to become dubious about paying much more for a property than what the state commission considers a fair value. In this way a stop may be put to the practice of some speculators who obtain options on properties which they foresee will be needed in a coming interconnection or consolidation and then sell out at a big profit. So long as the practice of grabbing up properties for resale and pyramiding of prices continues, the ultimate holder of the property will find it hard sledding.

The Indiana commission, for example, will not permit any excess in purchase price above the fair value as determined by the commission to be charged to capital or operating account. If many other states take this stand—and some have—it will have a marked effect upon consolidations which have been put through because of speculative rather than operating advantage. Fortunately, the number of mergers which come very close to the range of the "blue sky" laws is small as yet in this industry; but the very success of the electric light and power business makes it just so much more attractive to speculators and "green-goods" men, and against these the industry must constantly be on guard.

Intensity of Illumination and Eye Fatigue

CIVILIZATION has been accustomed to relatively low intensities of artificial illumination for so many centuries that the efforts to increase the level in keeping with modern efficiency in light production arouse certain questions. Some of these can be answered by calling attention to the lighting conditions outdoors under which the human race evolved. Notwithstanding the fact that most persons do not suffer appreciable eye fatigue under hundreds of foot-candles of daylight, many bring up the question of eye fatigue when it is proposed to increase the intensity of artificial illumination from a few foot-candles to twenty or thirty. Within a reasonable range, intensity of illumination is not a primary factor in producing eye fatigue. In fact, most of our artificial lighting is so inadequate and so improperly done as to cause noticeable eye fatigue.

Although actual experiments are unnecessary to convince those who are acquainted with the intensities of daylight illumination that adequate and proper lighting decreases rather than increases eye fatigue, such investigations are valuable in convincing most persons. Recently P. W. Cobb and F. K. Moss, working in the lighting research laboratory at Nela Park, Cleveland, have shown that an intensity of artificial illumination of 100 foot-candles is no more fatiguing to the eyes than 5 foot-candles for the same visual work. An unusually fatiguing visual operation was devised in which the test object was so large that it was far above the threshold of visibility even at the lower intensity. The balance of the extrinsic muscles of the eye is a highly co-ordinated and delicate mechanism. When the eyes are fatigued this muscle balance is more or less disturbed. These investigators used nine adults, each of whom was subjected for five different periods to each of the two intensities of illumination, and found that the disturbance of muscle balance was no greater for the high intensity than for the low one.

This is extremely interesting, considering that the eyes were not obliged to distinguish fine details; for if they had been, the eye fatigue would have been greater for the low intensity. The investigation was planned purposely so that the only important variable was intensity of illumination. Under such conditions it is very significant that the 100 foot-candles were no more fatiguing than the 5 foot-candles. Thus one by one the questions raised are being answered in favor of much higher intensities of artificial illumination.

Interlocking Circuit Breakers and Disconnecting Switches

PRECAUTIONS to prevent accidental opening or closing of the wrong disconnecting switches are, of course, being taken in the many generating stations and substations under construction. Opening the wrong "disconnect" may seriously injure the operator and will interrupt service on that circuit. Closing the wrong "disconnect" may injure some repairman or inspector, working on the circuit. Care in transmitting and receiving switching instructions may be of no avail unless some precaution is provided at the switches themselves to minimize the possibility of accidental operation.

In some stations every third barrier between disconnecting switches is painted red to aid in distinguishing one circuit from another. Signals or targets are frequently placed in close proximity to the "disconnects" to indicate whether the corresponding oil circuit breakers are open or closed. Mechanical interlocks are occasionally provided between circuit breakers and the corresponding compartment doors to prevent opening when the circuit breaker is closed. Some companies have gone further by providing mechanical interlocks between the circuit breakers and corresponding disconnecting switches so that the latter cannot be moved when the circuit breaker is closed.

Operating companies in minimizing hazards in their old plants or building new stations will have to decide the relative advantages of the foregoing precautions for themselves. The chief thing is to recognize the need of some precaution.

Vibration May Cause Failure in Transmission Spans

VIBRATION has long been known to be an important factor in transmission spans of unusual length, but it has seldom received any special consideration in the design of spans of up to approximately a thousand feet. The effect of vibration in these shorter spans has been evident to the engineers in charge of operation of the Big Creek 220-kv. lines in California for several years. Investigations undertaken nearly two years ago are still under way.

Cases have been found where a number of strands of the conductor as well as the ground wires on this and other lines have broken from a fatigue of the metal. Whether this is due to vibration set up by air currents or to bending at the point of support due to temperature cycles has not been determined. In addition to the length of span the tension of the conductor

is also one of the controlling factors. The important point is that, regardless of the cause of the vibration, or of the nature of the material in the conductor, or of other factors, more careful design is necessary to prevent trouble occurring sooner or later.

In the case of the long spans over Carquinez Strait in California, the long span over the St. Lawrence, the span over the Mississippi and other long spans great care has been taken to damp out vibration in the conductors near the dead-ends. It is now becoming apparent that equal care must be taken in connection with ordinary suspension attachments. The importance of the whole question is evidenced by the careful consideration being given to the design of transmission-wire attachments for proposed high-voltage lines in the interconnected systems along the Atlantic Coast and for new lines projected in California.

Developing Continuous Usage for High-Priced Equipment

SINCE coal expense is such a large proportion of generating expense, a utility company is liable so to concentrate on plant economies that it loses sight of the next biggest expense, namely, labor. This is no small item on outside construction work, and that many companies have recognized the fact is evidenced by the various steps they have taken to organize the personnel, instruct the men and schedule their work so that each man shall be used most efficiently. Many companies are also studying every means possible of substituting mechanical methods for labor, thereby increasing the productiveness of each human being, reducing turnover by taking the drudgery out of work and leaving to the men the exercise of their most valuable asset—their ability to make machines do what would otherwise have to be accomplished with brawn.

With relatively inexpensive labor-saving devices the problem is chiefly to ascertain whether they will do the work they are intended to do with a reasonable operating expense. As the price of the device or apparatus increases, however, this requirement must be supplemented by the adaptability of the equipment to enough uses to make the investment earn a return every day. In other words, some equipment is being tried today which when under use more than justifies itself, but it is being utilized so infrequently that the total fixed charges if applied to the few jobs it does would make the unit cost prohibitive. If this condition could not be changed, the employment of the apparatus, no matter how well it performs, could hardly be justified.

Before this conclusion is reached, however, it is advisable to ascertain whether the equipment cannot be applied to some other purposes than that for which it was originally intended. Imagination and ingenuity often find the way. The application of portable cranes to various classes of utility work in Ohio is a case in point. Sometimes modifications in the equipment or method of doing a piece of work may be required, but if their adoption will supply the economic justification for all-the-year use of a piece of apparatus which would otherwise do only an occasional job exceedingly well and economically, the modifications are justified. Where modifications in equipment would be costly to the user, the manufacturer might be induced to make them at less expense if he were impressed with the fact that the user could not justify the purchase of the apparatus for the original purpose alone.

More Interpretation of Meter Records

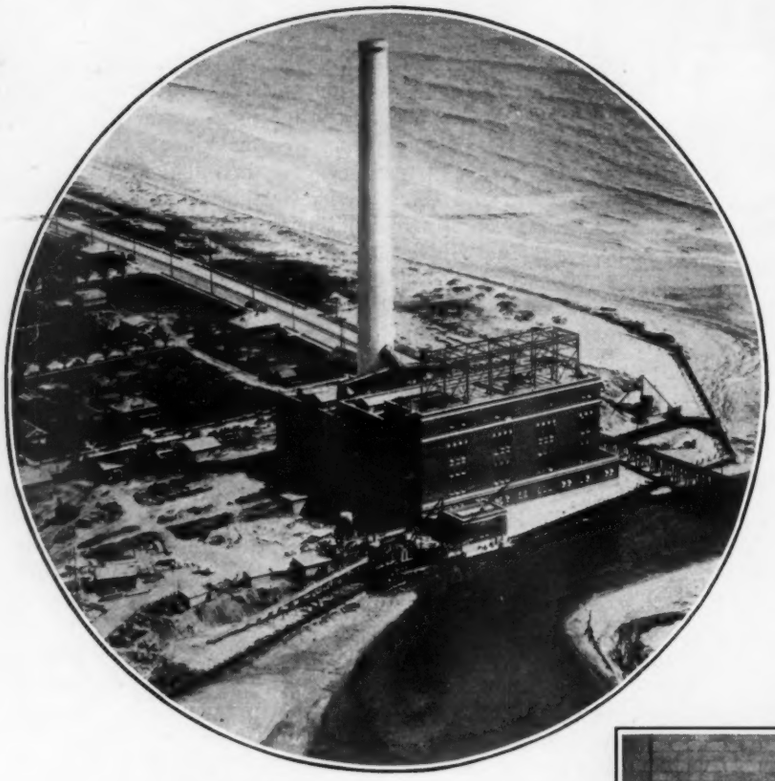
UTILITY men who regularly see the mass of records collected regarding their plant operations are raising a question regarding the justification of the expense involved. Some are prone to conclude all too quickly that too many instruments are installed and that too many records are kept. The latter is likely to be true if a careful study has not been made to ascertain the purposes for which the instruments were installed. In some cases their readings are only of momentary value. In other cases their readings should be analyzed with relation to each other to prevent repetition of an undesirable occurrence and to plan future operation. Or their records may be needed to settle a future dispute.

The answer to the question of expense thus lies in ascertaining what information is necessary, how it should be recorded to be of greatest value, and in making certain that the information needed is digested and the conclusions given to every department which can benefit from the information obtained. Failure to complete the latter function is what causes most companies that question the expense to fail to get the greatest return on the investment in instruments and in the time taken to record information.

Since no information is quite so adaptable to quick assimilation as graphical data, provided these are made available in convenient form, greater and greater attention is being given to applications in which graphical instruments are particularly advantageous. In the central-station industry more than in any other perhaps there are greater opportunities to effect economies and increase reliability of service by providing adequate facilities for records and then analyzing them, because more phases of performance are measurable. Providing the operators with records whereby they can see the effect of their own efforts will make for more intelligent operation. Causes of disturbances which react on public opinion can be detected by instrument records if they are suitably correlated chronologically and physically. Increasing interconnection of plants and systems demands more records for the best economy.

While each individual system has its ideas on how to use graphic instruments and records in handling year-in-year-out operating problems, there appears to be little knowledge, in common at least, regarding some of the newer applications. Some companies have found beneficial ways of applying graphic instruments to new purposes or for the better handling of old requirements, and it would benefit all companies if these ideas were disseminated. Interest has been shown in records that will (1) indicate to operators their degree of nearness to perfection, (2) allow analysis of causes of disturbance, (3) permit the most economical and reliable operation of interconnections, and so on.

Utilities will be helping themselves by advising instrument manufacturers of their problems in handling any applications, their suggestions for overcoming them, the desirability of having records reproduced at places distant from the point of measurement, the advisability of having related records made on the same chart or tape, the necessity of superposing similar records for successive periods, etc. A premium is placed on the cost of instruments by requiring a special design for every new application when standard types might be equally effective if properly applied. If careful study shows that standard instruments cannot be used for such purposes, then it is time to advise manufacturers of special requirements.



Seal Beach Station

of the

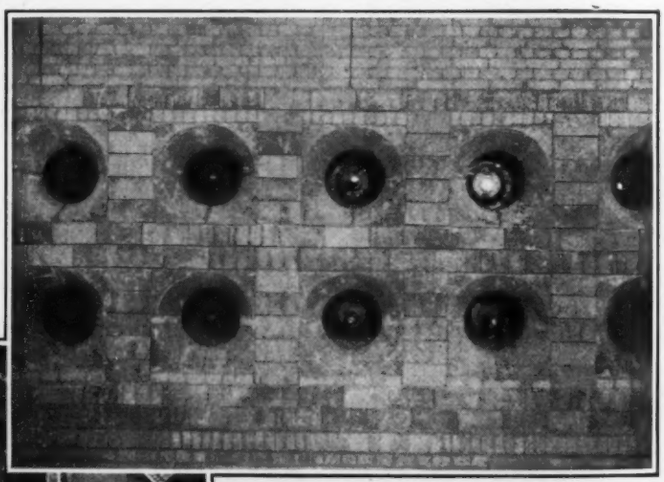
Los Angeles Gas and Electric Corporation

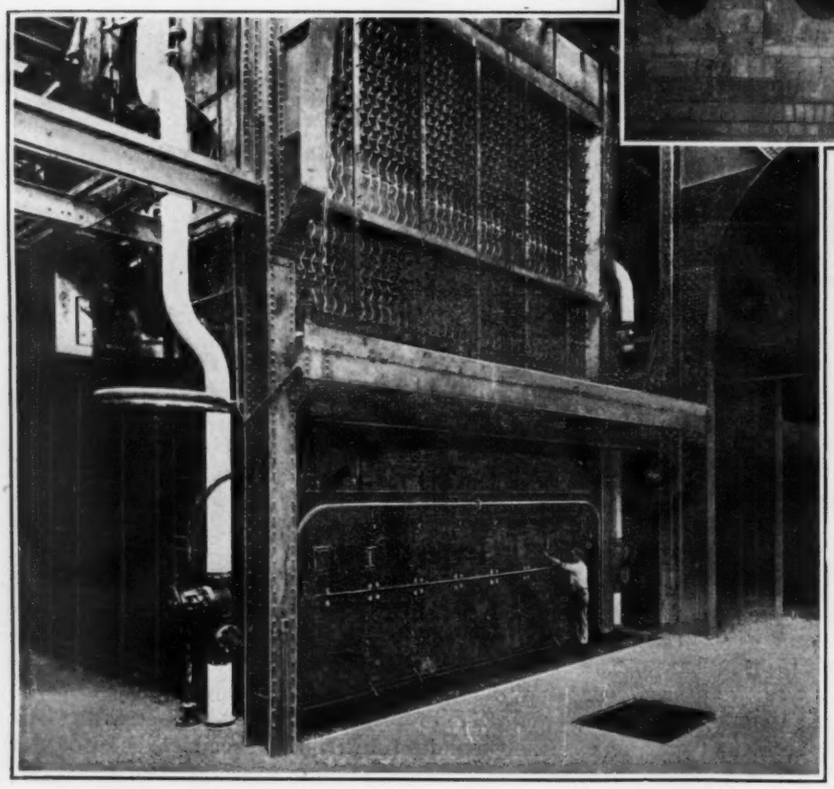
THE details of the Seal Beach Station have been worked out along safe and conservative lines with a view to high reliability and with due consideration to high thermal efficiency as an element in obtaining the lowest fixed charges. It is expected that an average thermal efficiency of 15,000 B.t.u. will be obtained.

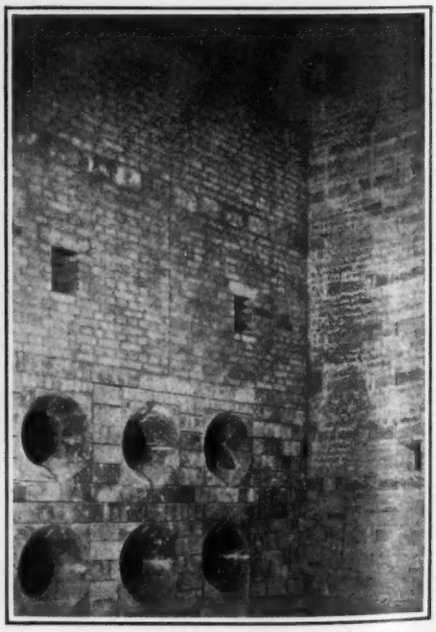
It is a gas-fired and oil-fired plant built on the ocean shore, 30 miles from Los Angeles, with a nominal ultimate rating of 200,000 kw. The first installation has building space for two 35,000-kw. units, one of which is installed.

The investment cost for the completed two-unit section, using the same unit price for the second unit as obtained for the first, will be $85 per kilowatt, based on the actual capacity of the machines.

The view at the left is an aerial photograph of the plant, while below are shown a section of the boiler room and the inside of the furnace showing burners and brickwork.







A Problem of All Private Business

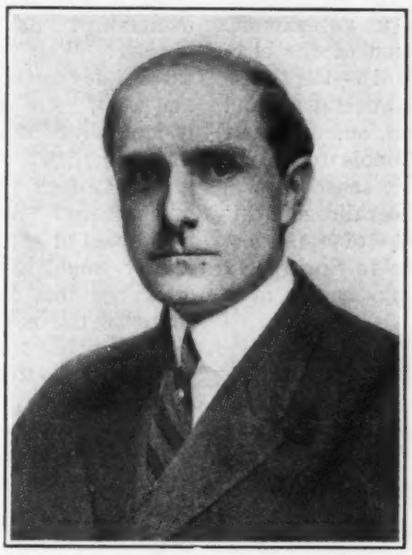
The Urge to Substitute Political Ownership and Operation Is Not Aimed at the Utilities Alone—The Necessity of All Private Enterprise Jointly to Disillusion Proponents of Public Ownership Is Urged

An Interview with

BRITTON I. BUDD

President Public Service Company of Northern Illinois

IT IS sometimes refreshing and enlightening for any one who has been very close to any activity for a long period to hear the viewpoints of a sane thinker who has not been so close to that particular "grindstone" and can view it from a broad angle without being distracted by a haze of intricate details. Such a viewpoint is even more valuable when the comments come from a person who has demonstrated by his accomplishments in a related field of activities that he is a straight thinker.



BRITTON I. BUDD

Seeking this viewpoint, a representative of ELECTRICAL WORLD approached Britton I. Budd about a year and a half ago, just shortly after he had been made president of the Public Service Company of Northern Illinois. Prior to that time, for a period of nearly eighteen years, he had been chief executive and managing head of the Chicago elevated lines (indeed, he stills holds that position), having instituted many commendable policies and practices that time has proved worth while. However, he evaded discussing any electric-service problems at that time, modestly saying he was so new to the electric-service field that his opinions would not be worth much. Approached again recently, Mr. Budd was questioned regarding several outstanding problems of utility companies. Of all these he considers that "combating government ownership propaganda" is the most vital problem confronting all private business at the present time.

"Whenever government ownership is mentioned," he declared, "we, who are in the public utility business, seem to think that it is ourselves and ourselves alone who are being discussed. Anyhow, we act that way; we accept the gage and go through the motions of lone-handed battling. When the din dies down, we are not just certain as to whom and what we have been fighting or what we have accomplished.

"In the light of recent happenings, many other industries entirely unrelated to our industry would seem to be realizing that this will o' the wisp—variously dubbed government, state or municipal ownership, or given some other convenient title—is of concern to other businesses besides the utility business."

Citing some examples of the widespread attempt to introduce political ownership, Mr. Budd said: "Industry, generally, seems to have encountered the propaganda. American farmers, who wrested their lands from wilderness through privations and physical hardships, have seen government ownership applied to their fellow farmers in Russia; have seen Russian farms taken away from their owners and parceled out to Soviet favorites under the red flag. They know that agricultural lands, which are vital to all nations, are seized first by revolutionists so that hunger may be used as a weapon to force the unwilling into submission. Newspapers have seen government ownership, as it works in Russia, stifle the press until news available to the public is equivalent to our *Congressional Record*.

"Sometimes called government ownership, sometimes called state ownership, sometimes called municipal ownership, sometimes called socialism, sometimes called nationalization of industries—depending upon which name sounds sweetest to those for whom the propaganda is planned—one definition seems applicable to what is meant by any or all of these phrases; that is, the confiscation of private property, of all industry and business, even to the land, with the stimulus of competition abolished and all business and industry put under political management to be provided by the "sovietiers." Here, in America, within the last few years we have seen states go into the banking, the milling and the grain-elevator businesses. All, of course, were failures, but they indicate the extent of the movement.

"The last election showed voters of Minnesota balloting on the question of state-owned elevators. We see insurance companies fighting strenuously against state ownership of insurance companies. Some states have built, and now own and operate, cement plants, and we know that in other states there is strong agitation, considered seriously, for doing likewise. We know of municipally owned grocery, fruit and vegetable markets in several communities. Agitation for federal ownership of meat-packing plants appears and vanishes, only to reappear in a different guise.

"From this it would seem that general business is letting talk of government ownership of Muscle Shoals and of railroads, and municipal ownership of utilities, obscure the real issue—namely, government ownership, nationalization, the sovietizing of all industries, all businesses, even ownership of the farm lands.

"In this ballyhoo for government ownership of the utility business, our perspective has become too nar-

row," contends Mr. Budd. "Was this phrase, 'government ownership,' coined for us alone? Let us see:

"When the Pilgrims came to America—that was long before the days of public utilities—they tried a communistic land experiment under the most favorable circumstances ever known. They were isolated, and bound together by close religious, family and financial ties. Their experiment failed and when they turned to individualism—private ownership—they became very prosperous and everybody was happy.

"The electric light and power industry dates back to only 1880, but it was ten years later before its importance was recognized. Was government ownership tried before that time? It was—and as respects several businesses. Take Illinois alone, as an example.

"Sixty-seven years before the inception of the electric light and power industry—in 1813—the state established its own banks at Shawneetown and Edwardsville. Both were dismal failures, enduring but ten years and leaving the people of Illinois to foot a deficit of $54,000—considerable money in those days.

"Also, the State of Illinois was in the railroad business. It planned more than 1,300 miles of railroads, completed a short piece from Meredosia to Springfield in 1842, and in 1847 sold to private purchasers at a heavy loss.

"These examples, restricted to but one state, have their counterpart in almost every state or nation the world over. Our own federal government was deeply involved in government ownership during the World War, in attempting to operate the Shipping Board, the railroads, and the telephone and telegraph systems. The results are too well known to be worthy of recapitulation. Yet it hasn't quieted the propaganda for this thing. The postal system, a law-made monopoly and operating under a heavy subsidy from the richest nation in the world, with all conditions favorable for success, pays its employees far less than does any private concern for men of the same high skill and intelligence.

WILL O' THE WISP

"What is this will o' the wisp, this government ownership, anyhow?" asked Mr. Budd. "Who keeps it bobbing up before business and has done so for a century? Do we know what it is all about? Have we any definite information about it, so that we can discuss the subject intelligently with the public and our employees? Is it fair of us to brand some one a 'freak' or a 'crank' because he advances a belief in government ownership, when we ourselves cannot offer him any real, accurate information on the subject he is talking about? Do business interests—not only the utility business but all businesses—know what is being taught our children and our neighbors' children in public schools and colleges?

"As to the latter, if our conservative business men who pride themselves on their honesty, on being 'pillars of society,' would read some of the school textbooks in daily use, many of them would find themselves referred to as 'oppressors of the poor,' as 'corrupt givers of bribes, on a par with safe blowers,' and 'escaping prison bars only through the connivance of crooked lawyers, judges and fixed juries.'

"We smile in self-satisfaction over complimentary pieces about ourselves and our businesses in publications which are friendly to, and mostly read only by, those in our industry. We exult over this same praise when applied to other businesses and to our friendly business associates. But always there is this bogy of government ownership hovering around.

ITS SOURCE, SCOPE AND PURPOSES

"Isn't it about time for us to run it to its lair?" questioned Mr. Budd with an emphatically implied affirmative answer. "Isn't it time for all businesses—the public utility business doing its part—to find out what is meant by 'government ownership'? What businesses are being talked about when it is mentioned? What is the history of the phrase 'government ownership'? When did it originate and what were the results when it was applied? Who is advocating government ownership? Is it American or does it come from abroad? Who, or what, are the individuals or organizations advocating it and paying for its dissemination, and why? Are schools and colleges playing any part in it, and why? What does government ownership propose to accomplish? What would be its effect on our government itself. Would it change the form of our government? Would there be brought into existence a new breed of supermen whose inventive and managerial ability would be greater than that of those who have developed this country since its foundation, or would there be the necessity of continuing the workers and managers, but without incentive to do their best, as was the case in Russia after the Reds took over the factories?

"Some of these questions may appear foolish. They are not; they are directly pertinent to propositions being 'sold' by agitators from the soapbox, that are included in some of our school textbooks, that appear openly in radical publications, that are slipped under a disguise into our conservative publications, whose publishers would be horrified to know that they were a party to spreading seeds of destruction.

"It seems to me," declared Mr. Budd, "it is about time we end idle talking; that we get together and obtain some real information about this miasma, variously called 'government ownership,' 'state ownership,' 'municipal ownership' and 'nationalization of industries,' but meaning one and the same thing. It should be a co-operative effort on the part of all business interests of the country as well as all others who are interested in the prosperity and development of the nation and who believe in American institutions and ideals."

Proposed Hydro-Electric Plant in Venezuela

THE Siemens-Schuckertwerke of Berlin have drawn up plans for a hydro-electric development in the Caruao Valley, about 47 miles from Caracas, Venezuela. The development, as reported in a Venezuelan newspaper, includes a storage reservoir 2,050 ft. above sea level with a 65-ft. dam and of enough capacity to furnish 330 gal. per second steadily. Electricity would be generated by three 4,200-hp. turbines coupled to 3,600-kva., three-phase, 60-cycle alternators at a voltage of 3,150.

The turbines would operate under an effective head of 1,950 ft. with one of the units held as a reserve. Energy would be transmitted at 44,000 volts over a steel-tower, double-circuit transmission line to Caracas, where it would be stepped down to 2,300 volts for distribution in the district.

Electric Power in Oklahoma Oil Fields

Referring Prospective Customers to Experiences of Seasoned Users and Indicating Through Study of Individual Cases How They Can Benefit Has Been the Means of Converting Many to Use of Electric Drive

ELECTRIFICATION of oil-well operations affords a fertile field for increasing the revenue of electric-service companies in oil-bearing territories, and several utilities have been very successful in convincing oil-company executives of the value of purchased power for this purpose. The Oklahoma Gas & Electric Company has been very active in this line. Its success, O. A. Jennings, new-business manager of the company, believes, has been due largely to the fact that it does not try to sell purchased power on generalized statements, but has collected and presented to prospective customers specific experiences and data from other companies engaged in similar work. Some of the information that has been found effective in selling electric service to oil-well companies will be presented for what benefit it may bring to other companies and also to encourage the exchange of more experience data on this and other power applications.

Some Experiences with Electric Pumping

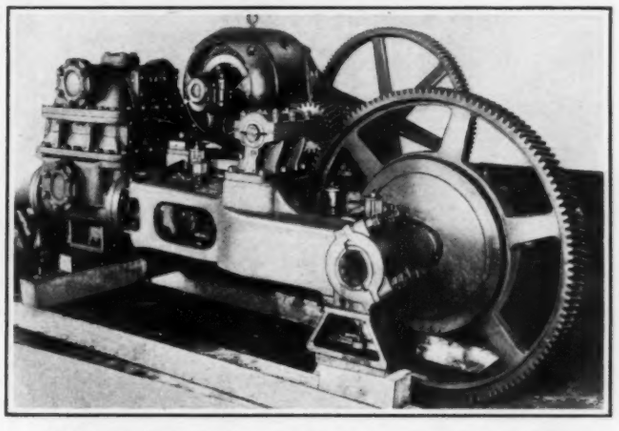
Unfortunately, few oil operators keep reliable records of well shutdowns, analyze their causes or estimate the amount of production lost because of these shutdowns. Where such records and analyses have been made the oil operators have found, much to their surprise, that a very substantial increase in production can be obtained by eliminating these shutdowns, heretofore considered unavoidable. A careful and detailed investigation of shutdowns has been made by the engineering department of the Empire Gas & Fuel Company. Knowing the number of possible pumping hours per well during the period covered, and the number of hours each well was shut down, it was found that in a group of 307 gas-engine driven wells averaging 31 bbl. per well per day there was a loss (because of engine trouble alone) of 160.5 bbl. of oil per well per month, and because of sucker-rod trouble alone of 163.9 bbl. per well per month. After all these wells were equipped with electric power, the first month's production was some 73,000 bbl. greater for the month than for the average of several months previously.

Since equipping all its oil wells with electric motors the American Petroleum Company in California has not only paid for the cost of installation but also more than paid the power bills, according to T. J. Crumpton, general manager. These wells were formerly pumped by gas engines. Prior to electrification eight wells in the Spindletop field, Texas, pumped from a central power produced 9,346 bbl. in two months. During the two months immediately subsequent to the change of drive the production was 10,791 bbl., or an increase of 11.6 per cent.

The effect of electric drive on oil-well production has been investigated by the Phillips Petroleum Company on thirty-one wells operating in the Bristow field. A careful check of the shutdowns over a three-month period disclosed the fact that the monthly production was 2,963.62 bbl. less than it might have been, or 97.7 bbl. per well per month lost production due to gas-engine and rod trouble alone. The loss was undoubtedly greater than this, as all the wells were making some water. As any one acquainted with oil field operation knows, when a water well is shut down it usually requires some time before it will again pump oil.

Some idea of the experience of the Shaffer Oil & Refining Company with electric-motor drive is afforded by a letter written by R. K. Huey, general superintendent of the company, to A. G. McDonald, auditor of the company owning the Tommy Atkins lease. It read:

Our labor costs were cut in half, as we employ just half of the pumpers as formerly, and one pumper handles all



MOTOR-DRIVEN PUMP OF HUMBLE PIPE-LINE COMPANY

thirteen wells during his tour, and could handle several more provided it were necessary. Other savings that have been material have been the longer life of our belts (for with electric equipment we have no clutches to contend with) and less rod troubles, due to the smooth action of the motor, and the reduction of vibration and jar that the rods sustain at each explosion of the gas engine.

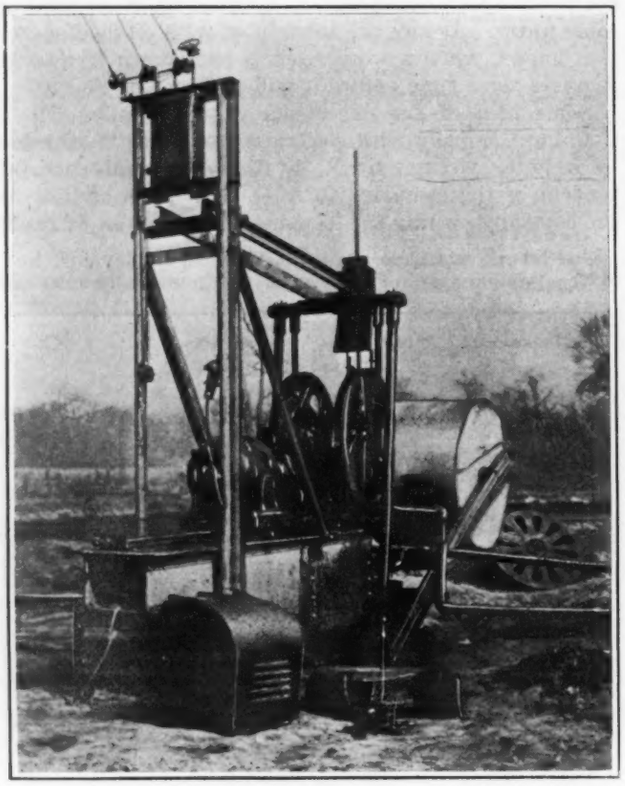
From the standpoint of increased production, it is difficult to give you a definite statement. In the mind of the writer there is no question but what we are able to obtain more production with the motor equipment than with gas-engine equipment, for the reason that our actual running and pumping time is much nearer 100 per cent, due to the fact that we have had almost perfect electrical service and because we have had practically no shutdowns due to the failure of the equipment itself. In the winter time, low gas or frozen water lines do not interfere with the operation of the motors, and on cold mornings the motors are started instantly, which, as you no doubt know, is not characteristic of gas engines. The production on this lease has more than held its own. The decline indicated during the gas-engine period has been materially checked.

Regarding the Turner lease, north of Slick, Mr. Huey said:

This is Dutcher sand production. The average cost for the first ten months of 1923 was $54.54 for power, lubricants and maintenance. This lease has five producing wells, one of which is shackled off another well. From the standpoint of efficiency, this is a poor arrangement, for the actual power consumption would be less provided this well had its own motor, rather than the shackle-line arrangement. On this lease we have two electrically oper-

ated DeLaval separators for treating the oil, the cost of operating which we estimate at about $50 per month. Current consumed in the operation of these separators, however, is figured in on the cost per beam motor not given you above. Incidentally, there has been considerab'e cleaning out on this lease and swabbing, which consumes more power than any other oil-field operation in so far as our experience is concerned.

In the preceding letter Mr. Huey refers to less rod breakage due to the smoother running of the motor compared with the gas engine. With electric motors, he has found that the shutdown time varies from ½ per



INDIVIDUAL MOTOR-DRIVEN PUMPING UNIT CLAMPS DIRECT TO WELL CASING

Perfectly counterbalanced and operated by 5-hp. squirrel-cage motor on wells up to 2,500 ft. deep.

cent to 3 per cent. Talking to prospective customers, to be conservative he assumes that the shutdown time of gas engines is 5 per cent and that of electric motors 1.8 per cent.

The repair expense of any equipment, of course, grows larger the longer the equipment is in use. According to figures from the American Petroleum Company, which installed fifty-five gas engines in 1911, the average repair and lubricating expense for 1912 was $23.43 per engine per month. On the Tommy Atkins lease in the Drumright field, where there are twenty-two gas engines operating, the average repair and lubricating expense for the year 1923 was $29.70 per well per month.

EXPERIENCES WITH ELECTRIC DRILLING

Briefly summarized, the advantages of electric over steam operation for oil-well drilling are as follows, according to Mr. Jennings: (1) Cheaper initial cost, (2) cheaper operating cost, (3) less depreciation, (4) no standby losses when equipment is idle, (5) none of the delays occasioned by the operation of steam boilers, (6) equipment is capable of developing several times its rated power, (7) explosions are eliminated and fire risks reduced, (8) motor cannot run away should the wire line break or a belt run off, (9) considerable saving in time due not only to faster operation but also because of elimination of delays incident to steam operation.

On the basis of present prices a standard cable-tool equipment, including the motors, controllers, oil circuit breakers, countershaft and countershaft pulleys, can be installed complete ready to run, but exclusive of all belts, buildings or foundations, for approximately $3,200. If a circulating pump is to be used, necessitating the installation of a 50-hp., adjustable-speed motor, this figure will be increased to approximately $5,100. Since all electric rotary drilling rigs require the circulating pump motors, the latter figure will cover a 75-hp. rotary installation. If a 100-hp. motor is used on the draw works and rotary table, the installation complete with mud pump will approximate $5,400. These figures are for electric equipment only.

The cost of operating drilling equipment varies according to the nature of the equipment, the character of the territory, the depth of the well and prevailing rates of power companies furnishing the service. Naturally as the hole goes down the cost increases, since it takes longer to bail, longer and heavier strings of casing must be handled, and the weight on the beam constantly increases. The following extracts from letters collected by one company from various well operators in both southern and northern California fields tell the story of electric drilling equipment from the standpoint of the operator:

E. W. Klein, secretary of the San Fernando Gas & Oil Company of Los Angeles, operating near Newhall, Los Angeles County, says:

> Our operating expense to date has not exceeded $200 per month for power and lights, running full capacity twenty-four hours daily. We consider electric power the best and most economical as well as the cleanest of any power for oil drilling. The well was drilled to 1,800 ft.

F. L. Van Epps of the Beatty Oil & Development Company of Los Angeles, operating on the lease at Eagle Rock, Los Angeles County, says:

> I have been very careful in watching the operation of the motor and in observing how the drillers like it. Our motor operates the tools beautifully. We can get almost any speed desired and the tools drop as freely as with steam. We can pull the tools or bailer faster with the motor, and we at all times have "steam up" and have no delays with waiting for the tooley to get up steam, clean the flues, or any of the dozen delays that go with the average steam plant, and if some one burns out a boiler, it is no bother to us. As to the cost of operating our motor, in January we drilled twenty-two days and used "juice" for five days more, and the total power bill was $93.70, or about $3.34 per day. In February, for twenty-nine days, our bill was $92.03, or about $3.17 per day. I am confident that the electric equipment on this lease shows a saving of 75 per cent over the cost of operating a steam plant, and at least 15 per cent in the efficiency of the men, as they are where they are needed—on the derrick floor.

Albert Miller of the Active Oil Company of Los Angeles, operating at Sylmar Station, near San Fernando, Los Angeles County, writes:

> Our total monthly power bills (including light bills) for the dril'ing of our well from the beginning of operation are as follows:

	Kw.-Hr.
Dec. 12 to Jan. 12	6,340
Jan. 12 to Feb. 12	6,880
Feb. 12 to March 12	7,480

> On March 13 the hole was 565 ft. deep, but a consider-

able quantity of power was employed, not in making the hole but in dealing with conditions caused by heaving sands.

W. Nelson Shell, president of the San Fernando Oil Company, operating in Pacoima, near San Fernando, Los Angeles County, writes:

Our power and lighting bills since installation of your system have been as follows:

Period	Light	Power
Oct. 2 to Oct. 11, 1919.....	$1.04	$27.60
Oct. 11 to Nov. 12, 1919.....	42.79	184.36
Nov. 12 to Dec. 13, 1919.....	43.76	287.18
Dec. 13 to Jan. 13, 1920.....	37.46	163.24
Jan. 13 to Feb. 13, 1920.....	29.21	182.16

We estimate that the use of fuel oil for the work we are doing, including transportation to our lease, would run about $800 to $900 per month, indicating, as you will see, quite a material saving.

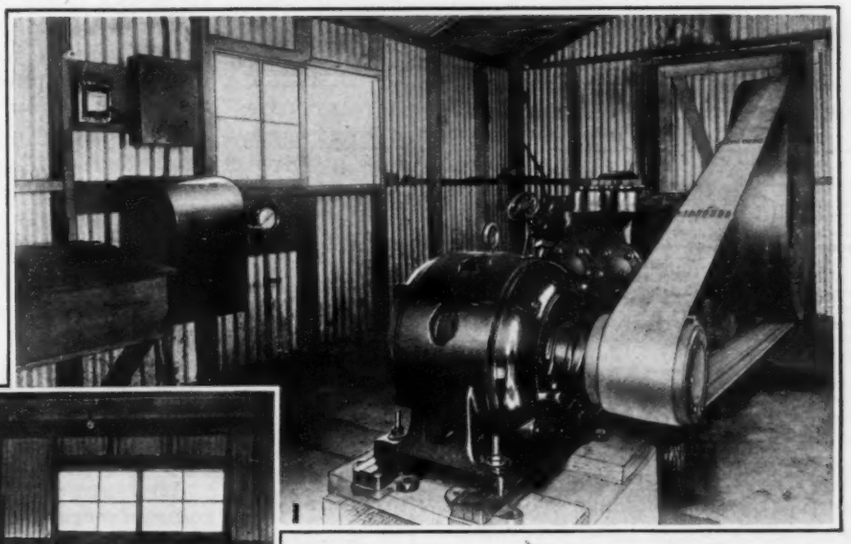
An old established company in Ventura County, which is at present operating eight standard cable tool rigs with mud pumps and agitators, furnished the following data on a well recently drilled, the particular well not having included a mud pump in its equipment:

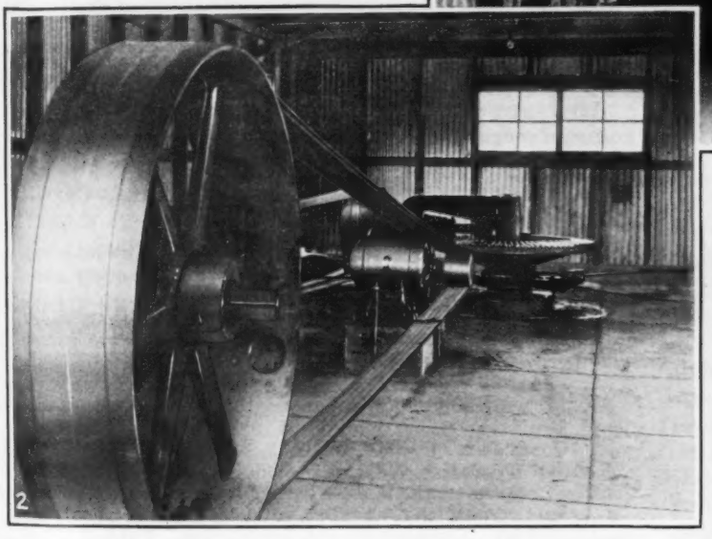
Period.....	5/1–7/26	7/26–8/26	8/26–9/25	9/25–10/31
Cost of power.....	$132.85	$163.50	$201.25	$202.20
Depth, feet.....	1,096	1,407	1,952	2,129
Period.....	11/1–11/26	11/26–12/27	12/27–1/27	Well brought in
Cost of power.....	$212.15	$217.88	$94.20	
Depth, feet.....	2,274	2,581	2,987	

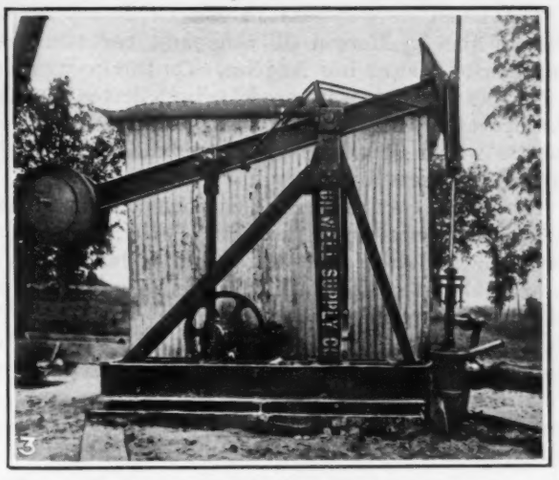
The above figures cover standard 75-hp. cable-tool equipment operating without mud pump or agitator motors, but inclusive of lights, forge blowers, etc. The Shell Company of California is operating four equipments consisting of a standard 75-hp. cable-tool drilling motor, with a 40-hp. mud-pump motor. The power company furnishing this company service supplied the following information:

On well "A" the total bills rendered for the twelve months of 1919 amounted to $3,936.44, an average of $328 per month. On the Turnbull Canyon well the total bills rendered for the four and one-half months which this well has been drilling amount to $1,221.24, an average of $271 per month.

The former well has been completed and "put on the beam" at a depth of 4,580 ft., and was at that time the deepest oil well ever drilled with complete electrically operated equipment in the United States.







No. 1—Pipe-line pump of Shaffer Oil & Refining Company, Tulsa, driven by 20-hp., 400-volt, 1,725-r.p.m. motor with compensator.
No. 2—Geared central power of Wingfield & Dobie, Stephens, Ark., driven by 15-hp., 1,200-r.p.m. motor.
No. 3—Individual power jack of Echo Oil Company, Tulsa, driven by 7½-hp. motor.

A FEW TYPICAL INSTALLATIONS OF ELECTRIC PUMPING EQUIPMENT IN OKLAHOMA OIL FIELDS

The Western Union Oil Company drilled the Smiley No. 1 well at Whittier, Los Angeles County, to a depth of 2,520 ft. with a standard rotary equipment consisting of a 100-hp. drilling motor and 50-hp. mud-pump motor in a total elapsed time of forty-five days, of which sixteen were required for actual drilling, at a total cost for power and lights of $325.

The Western Union Oil Company on the Harris lease near Orcutt, Cal., drilled a well with a rotary equipment using a standard 75-hp. drilling motor and a 40-hp. mud pump motor at a total cost for the period of five weeks from Nov. 11 to Dec. 17, 1919, inclusive, of $306.60, or an average of $245 per month. In this time a total depth of 1,850 ft. was reached. This well was drilled by standard cable tools to a depth of 4,300 ft. at an average power cost per day for the entire period of drilling operations of $8.44, inclusive of lights. Other wells were being drilled near by with steam equipment, and the average fuel consumption was 40 bbl. per day, the cost of fuel oil at that time being

TABLE I—INSTALLATION COSTS

Gas Engine:	
30-hp. gas engine installed	
100-bbl. water tank at each well	
2-in. water line	
2-in. gas line	
Total per well	
Electric Motor:	
35/15-hp. motor installed complete	$1,730
Secondary electric transmission line per well	285
Total per well	$2,015
Additional per well for substation and primary line, if power purchased on wholesale rate	155
Total per well	$2,170

TABLE II—COMPARATIVE OPERATION PER MONTH (THIRTY DAYS)
Production per well per day, 200 bbl.

Gas Engine:	16 Wells	40 Wells
Lost production, (5% shut down)	4,800 bbl.	12,000 bbl.
Value at $1.85 per barrel	$8,880.00	$22,200.00
Average repair expense, $15 per well	240.00	600.00
Lubricating oil, 3 qt. per day per well @ 56c. gal.	201.60	504.00
Total	$9,321.60	$23,304.00
Electric Motor:		
Lost production (½% shut down)	1,728 bbl.	4,320 bbl.
Value at $1.85 per barrel	$3,196.80	$7,992.00
Lubricating oil (less than 5 gal. per year per well)	3.75	8.35
Average repair expense, $3.50 per well	56.00	149.00
Electric power bill	912.00	1,984.00
Total	$4,168.55	$10,125.35
Monthly net saving electric motor over gas engine	$5,153.05	$13,179.65
Annual net saving electric motor over gas engine	$61,836.00	$168,155.00

$1.50 per barrel delivered at the well, making the charge for fuel oil alone average $60 per day, to which must be added the cost of boiler-feed water.

The latest development in electric rotary set-up is that of the La Merced Oil Company, operating in the Montebello field at Los Angeles. On this particular rig 1,240 rotary chains were used for both drives, but should the operator later decide to use silent-chain drive, no change would be necessary except substitution of the proper sprockets and chain.

The initial cost of electric equipment is rather high, but maintenance costs, including power, are comparatively low and soon offset the increased initial cost over the initial cost of steam installation, according to a report of the state oil and gas supervisor, California State Mining Bureau. The estimated cost of a 75-hp. drilling motor for cable-tool drilling, complete, including electrical connections, countershaft or reduction gear, and belting, is $3,100. The approximate costs of electric equipment for a rotary drilling rig are as follows:

One 75-hp. drilling motor, all equipment, connections and reduction gear	$3,900
Cost of installation of motor (labor, hauling, material)	150
One 50-hp. motor for slush pumps, complete	1,600
Two power-driven slush pumps 6½x12 in., with belt and pulleys	5,250
Cost of installation of motor and slush pumps (labor, hauling, material)	190
Total	$11,090

The following table gives a list of the companies in southern California that have used or are now using electrically equipped rotary rigs:

Company	Location	Number Rigs Operating
Snell Co. of California	Brea	5
San Martinez Oil Co.	Signal Hill	4
Prudential Pat. Co.	Signal Hill	1
Chanslor-Canfield Midway Oil Co.	Santa Fe Springs	1
Nevada Ventura Oil Syndicate	Signal Hill	1
Mission Oil Enterprise	San Diego	1
Standard Oil Co.	Newhall	1
Vista Del Mar Oil Co.	Huntington Beach	1
Little Chief Oil Co.	Tulare Lake	1

The following table gives the power consumption on a rotary rig in drilling to a depth of 3,000 ft. by the Western Union Oil Company in the Santa Maria field. This includes power to a 75-hp. drilling motor and a 30-hp. slush-pump motor:

Month	Kw.-Hr.
December	17,712
January	6,384
February	11,712

Some reliable power consumption figures are based on actual meter readings taken not only over a considerable period of time but also on a number of different rigs in various fields and show the average energy consumption per twenty-four-hour day to be:

	Energy Consumption per 24 Hours
1,000-ft. territory	150 to 170 kw.-hr.
1,500-ft. territory	180 to 215 kw.-hr.
2,000-ft. territory	200 to 235 kw.-hr.
2,500-ft. territory	230 to 270 kw.-hr.
3,000-ft. territory	250 to 285 kw.-hr.
3,000-ft. territory and over	265 to 350 kw.-hr.

Records of the Pinal Dome Oil Company show the following costs for power when drilling by the three different methods:

Power Installation	Location	Depth Drilled, Ft.	Cost per ft.
Electric motor	Santa Maria	5,108	$0.45
Gas engine	Texas	5,208	.87
Steam	Texas	4,000	1.00

After presenting data and experience like the foregoing in more or less detail to executives of prospective oil field customers, Mr. Jennings sometimes finds it advisable to submit a report to the prospective customer, analyzing his specific case, as follows:

My dear Mr. Jones: As you suggested, we have made up the following report on the comparison of operating your lease with electric power and with gas engines.

A careful analysis of the proposition shows that based on a production of 200 bbl. per well per day *electric power will increase your company's annual net for sixteen wells . . .* $61,836.

Should your company complete the twenty-four additional projected wells, making a total of forty, *electric power would then increase your annual net . . .* $168,155.

Installation Costs—We are inclosing the original quotations we requested the ——— Supply Company agent for ——— motors and the ——— Electric Company, agent for ——— motors, to submit on the proposition. Table I gives the itemized statement of the installation cost.

You will note that we have enumerated the various items entering into the gas engine installation, but we have not given the cost of these items, as we thought you could obtain more definite figures from the actual cost of those engines which you have installed.

Oil-Field Rate—We would supply you with power on the oil-field rate and run our 13,000-volt line to your lease and supply the necessary substation transformers. You would supply the necessary secondary transmission on your lease, together with the motor installations. Your cost would be as follows:

Installation cost at well, including secondary distribution	$2,015
Approximate power bill per well per month on the basis of sixteen wells pumping twenty-four hours	75

Wholesale Power Rate—If your company would connect to our 13,000-volt transmission line, which we will run through the field, and purchase power from us at 13,000 volts, you supplying the necessary lease substation transformers, your cost would be as follows:

Installation cost at well, including secondary distribution	$2,015.00
Additional per well for substation and primary line	155.00
Average total cost per well	2,170.00
Average monthly power bill per well, basis sixteen wells	57.00
On basis of forty wells, because of the fact that a great deal of power will be purchased at the lower steps of the power rate, the average monthly cost per well will be	49.60

Yours very truly,
Manager Commercial Department.

Seal Beach Plant Operating

New Steam Station of Los Angeles Gas and Electric Corporation Latest Fuel-Fired Plant in California — Designed for Oil and Gas Burning—Initial Installation Consists of 35,000-Kw. Unit

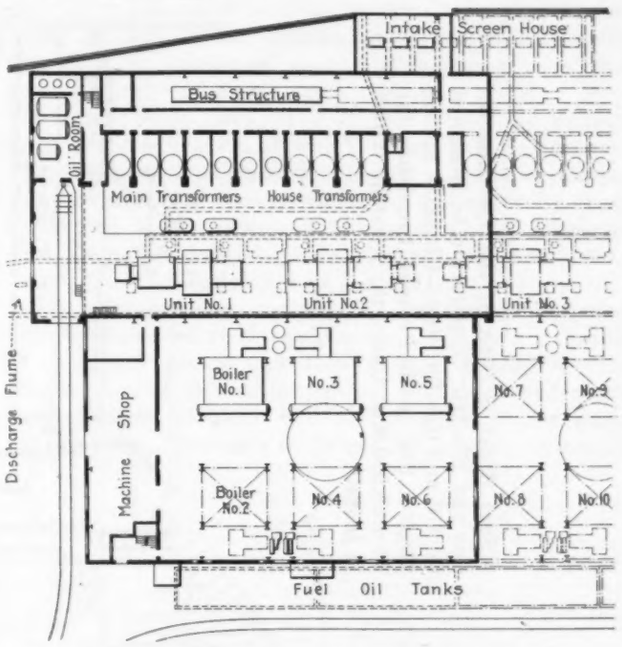
By J. G. ROLLOW* and D. L. GALUSHA†

THE latest large steam plant to go into operation on the Pacific Coast is the Seal Beach station of the Los Angeles Gas and Electric Corporation. The policy underlying the design of the new station was to obtain the lowest total cost of output, inclusive of fixed charges on the investment, consistent with the high standard of service to be met. The details have therefore been worked out along safe and conservative lines with a view to high reliability and with due consideration to high thermal efficiency as an element in obtaining the lowest over-all cost of energy inclusive of fixed charges. Perusal of the accompanying illustrations will give an idea of the general arrangement.

Seal Beach is a gas-fired and oil-fired plant built on the ocean shore and is to have a nominal ultimate capacity of 200,000 kw. The first installation has building space for two 35,000-kw. generating units, one of which has been installed. The plant is about 30 miles from the business center of Los Angeles. Owing to the topography of the shore, existing ocean-front property developments and adverse water conditions, there are very few suitable sites. The location chosen is the nearest to the load of those considered acceptable under existing conditions.

A simple boiler house is possible where the design contemplates only oil and gas fuel. The boilers are of the cross-drum, straight-tube type and are designed to operate at 375 lb. per square inch gage, superheated to a total temperature of 700 deg. F. Each boiler contains 25,450 sq.ft. of heating surface and is twenty tubes high by forty-three wide, with tubes 24 ft. long. This size is based on two operating units per turbine, with a third boiler for spare capacity for the first installation.

The boilers are provided with tubular-type air preheaters designed to raise the temperature of the combustion air to about 300 deg. F. and reduce the flue-gas temperature to about 360 deg. F. The installation of induced-draft apparatus was considered, but it was determined that a suitable stack 375 ft. high measured



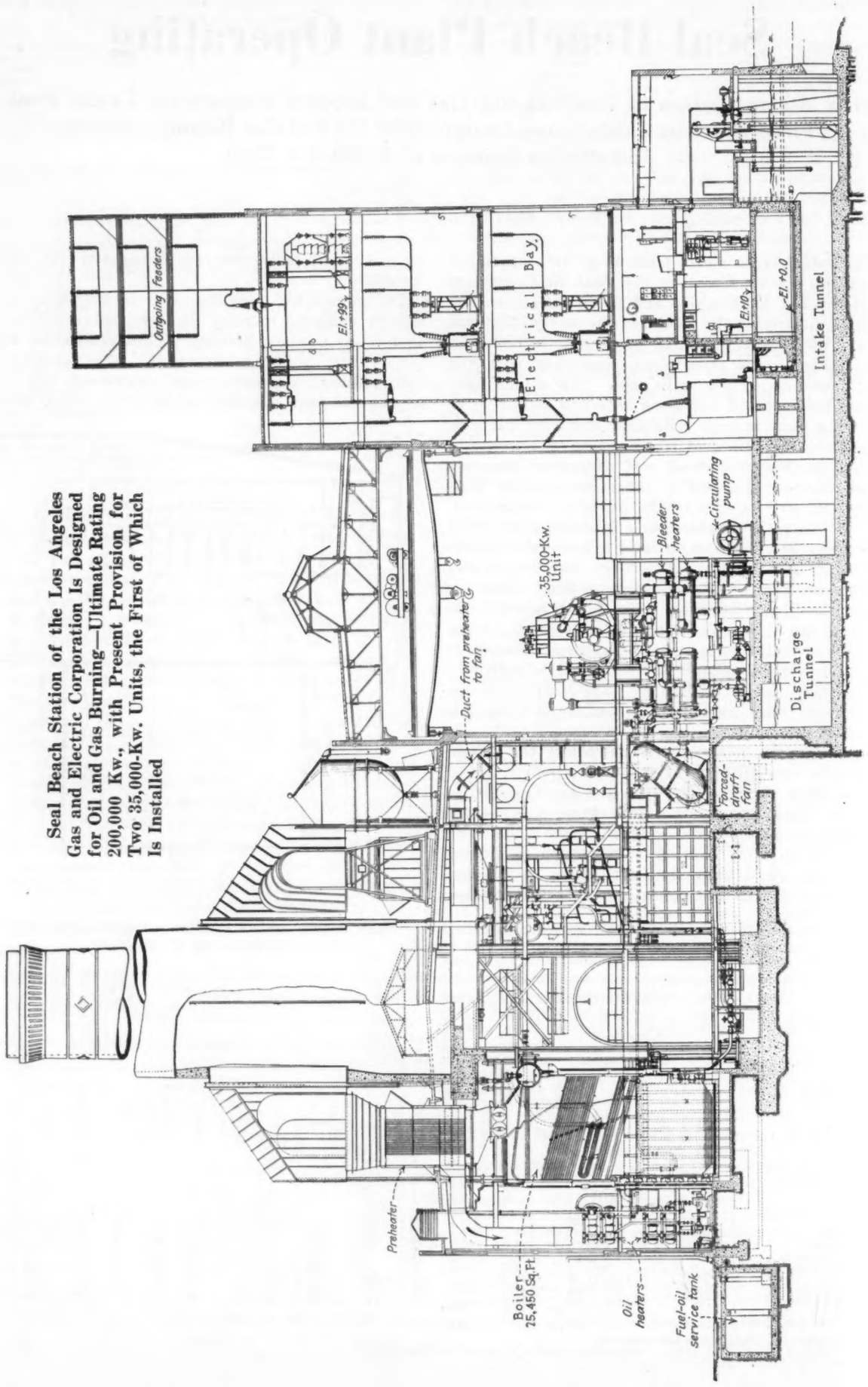
PLAN OF SEAL BEACH STATION, SHOWING HOW FUTURE SECTIONS ARE TO BE ADDED

*Electrical engineer Los Angeles Gas and Electric Corporation.
†Consulting engineer Dwight P. Robinson & Company, Inc.

DISTRIBUTION OF AUXILIARIES FOR TURBO-GENERATOR UNIT

Motors	Boiler Room (Present three boilers, ultimate eighteen boilers)					Turbine Room (Present one unit, ultimate six units)				440-Volt System and Lights							
	Force Draft	Spare	Boiler Feed	Air Compressor	Total A	Circulating Pump	Hot-Well Pump	Exciter	Total B	Service	Crane †	Screen	Transformer Cooling	Storage	Miscellaneous	Total C	Total A + B + C
Present	3	2	2	1	....	2	2	2	....	2	...	2	2	1	..	.....	.....
Ultimate	18	...	7	1	....	12	12	7	....	12	...	12	12	2	..	.....	.....
Size, hp		150															
One-unit, normal	150	100	400	100	....	250	100	310	....	50	291	7.5	40	65	..	.....	.....
One-unit, emergency	200	...	350	90	640	360	70	300	730	60	..	7.5	40	40	30	177.5	1,547.5
One-unit, cold-starting	200	...	350	0	550	360	70	300	730	0	..	7.5	40	0	25	72.5	1,352.5
One-unit, warm starting	0	...	150	0	150	180	50	0*	230	0	..	0	20	0	0	20	400
Ultimate normal	0	...	0	0	0	180	50	0*	230	0	..	0	20	0	0	20	250
Connected load, one unit	1,200	...	2,100	90	3,390	2,160	420	1,800	4,380	360	...	45	240	80	165	890	8,660
Connected load, ultimate	450	...	800	100	1,350	500	200	620	1,320	100	291	15	80	65	137	688	3,358
	2,700	...	2,800	100	5,600	3,000	1,200	2,170	6,370	600	291	90	480	130	510	2,101	14,071

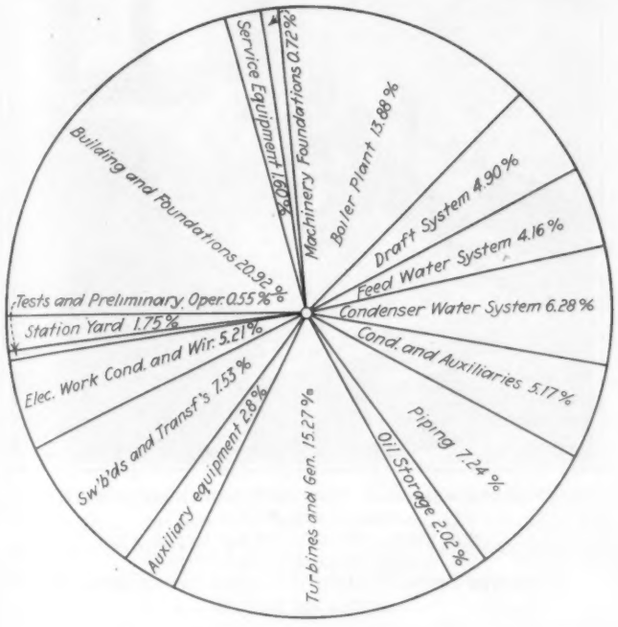
* Assumes steam is available under this condition.
† Traveling crane motors: Hoist 100 hp., bridge 83 hp., trolley 25 hp. and auxiliary 83 hp.



Seal Beach Station of the Los Angeles Gas and Electric Corporation Is Designed for Oil and Gas Burning—Ultimate Rating 200,000 Kw., with Present Provision for Two 35,000-Kw. Units, the First of Which Is Installed

from the boiler-room floor would be more economical.

The combustion air is drawn through the preheaters by the forced-draft fans and delivered to special cast-iron cooling ducts which are placed vertically in the rear and side walls of the furnace and which carry the air down to a space provided beneath the furnace. The air passes through this space to the hollow furnace front and thence to the burners. Each furnace is provided with fourteen combination oil and gas burners of



INVESTMENT COST FOR COMPLETED TWO-UNIT SECTION TO BE $85 PER KILOWATT

the mechanical atomizing type. The fuel oil is heated in part by the exhaust from the fuel-oil pump and in part by steam direct from the boilers.

In view of the general tendency toward higher steam pressures in power-plant practice, the possible advantage of higher pressure in this installation was carefully studied. The decision to use 375 lb. was reached after careful consideration of possible gains in thermal economy as against increased cost of equipment and decreased reliability of service.

OPEN-TYPE TURBINE ROOM

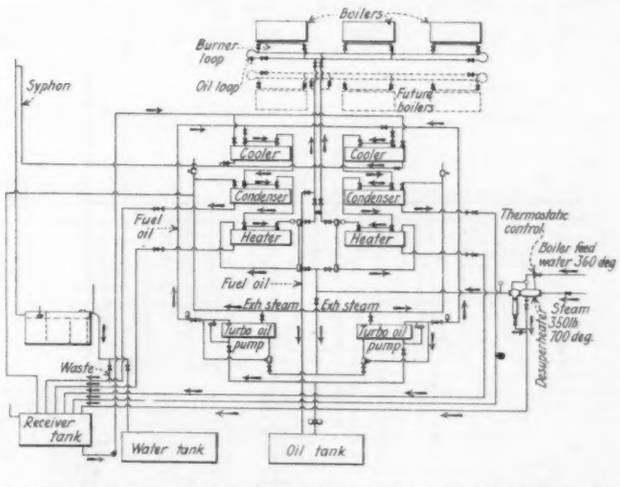
The turbine room is of the open type, gallery-floor area only being provided at the turbine operating level to allow a proper working space, the rest of the area being left open to permit ventilation, light and accessibility for the basement. The units are set with shafts parallel to the boiler house, resulting in advantageous balance between the length of the turbine room and boiler room in the ultimate design.

The turbines are single-cylinder combined impulse and reaction type with divided exhaust. They are provided with four openings for the extraction of steam for feed heating. The condensate is passed from the hot-well pumps successively through a generator air cooler of the surface type, a heat exchanger for cooling the transformer cooling water, bearing oil coolers and the inter and after coolers of the steam-jet air pumps. Though this system results in recovery of the losses involved in the apparatus noted, the same reclamation of heat could be accomplished in the bleeder heaters. The main object in using condensate for these cooling operations is to insure clean water in the coolers and to eliminate the labor and trouble involved in frequently cleaning the cooling apparatus. The condensate flows from the air ejectors through the two low-temperature heaters to the boiler-feed pumps and thence through the two high-pressure heaters to the boilers, its final temperature being about 360 deg. F. The heaters are so arranged that in case of flooding, the affected heater will be automatically cut out both on the steam and the water side.

The condensing equipment consists of a single-shell, two-pass surface condenser of 45,000 sq.ft. Two circulating pumps are provided, either of which is large enough to serve the condenser when water temperature is normal.

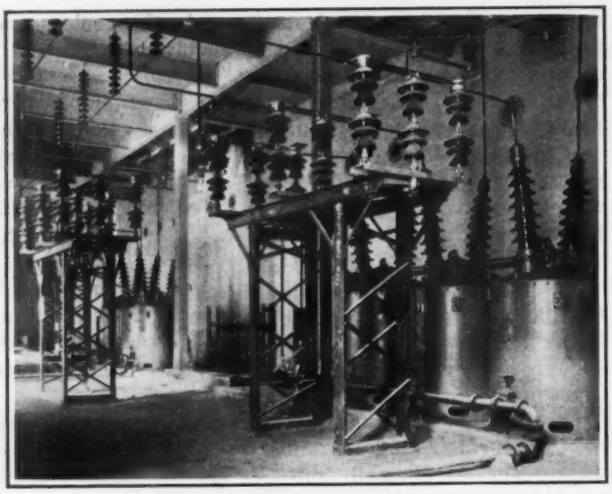
On the end of the main turbine shaft is an auxiliary generator rated at 2,400 volts, three-phase, 1,567 kva. This generator normally supplies the important station auxiliaries, either direct at this voltage for large motors or through transformers for the smaller motors. With the exception of a steam-driven boiler-feed pump for starting purposes, all auxiliaries are electrically driven. Relay service for the auxiliaries is provided through transformers connected to the high-tension bus and receiving current either from the main units or over the transmission lines. For further protection certain motors, the operation of which is essential to continuous service, such as those driving the circulating pumps, are provided with means for going automatically from either bus, in case of trouble, to the other. This means that simultaneous trouble must occur on both buses before the auxiliaries are in jeopardy.

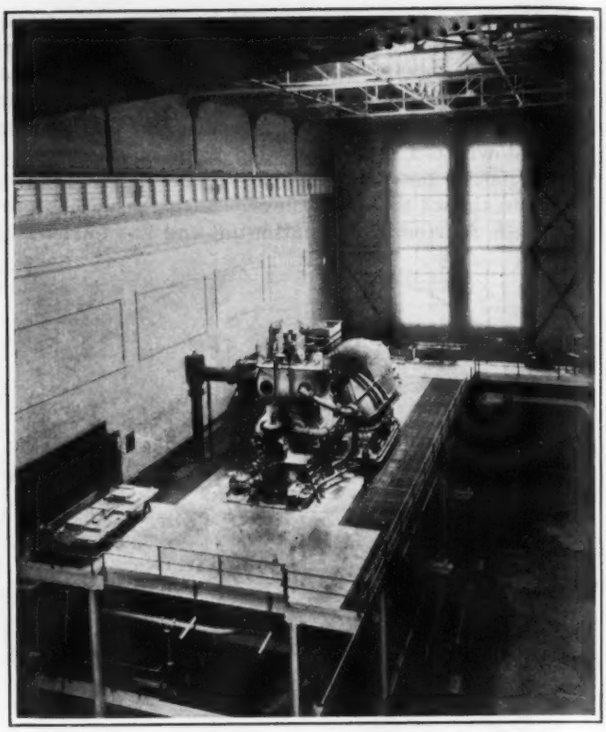
The switch house contains all the low-tension and high-tension electrical equipment, offices, etc. Owing to extremely severe salt fogs it was deemed unwise to place any of this equipment out of doors. Reference to the wiring diagram will give an idea of the main connections. Inasmuch as the power is all to be trans-

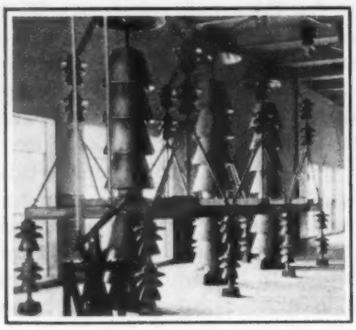


FUEL-OIL SYSTEM MAKES POSSIBLE SIMPLE BOILER-ROOM DESIGN

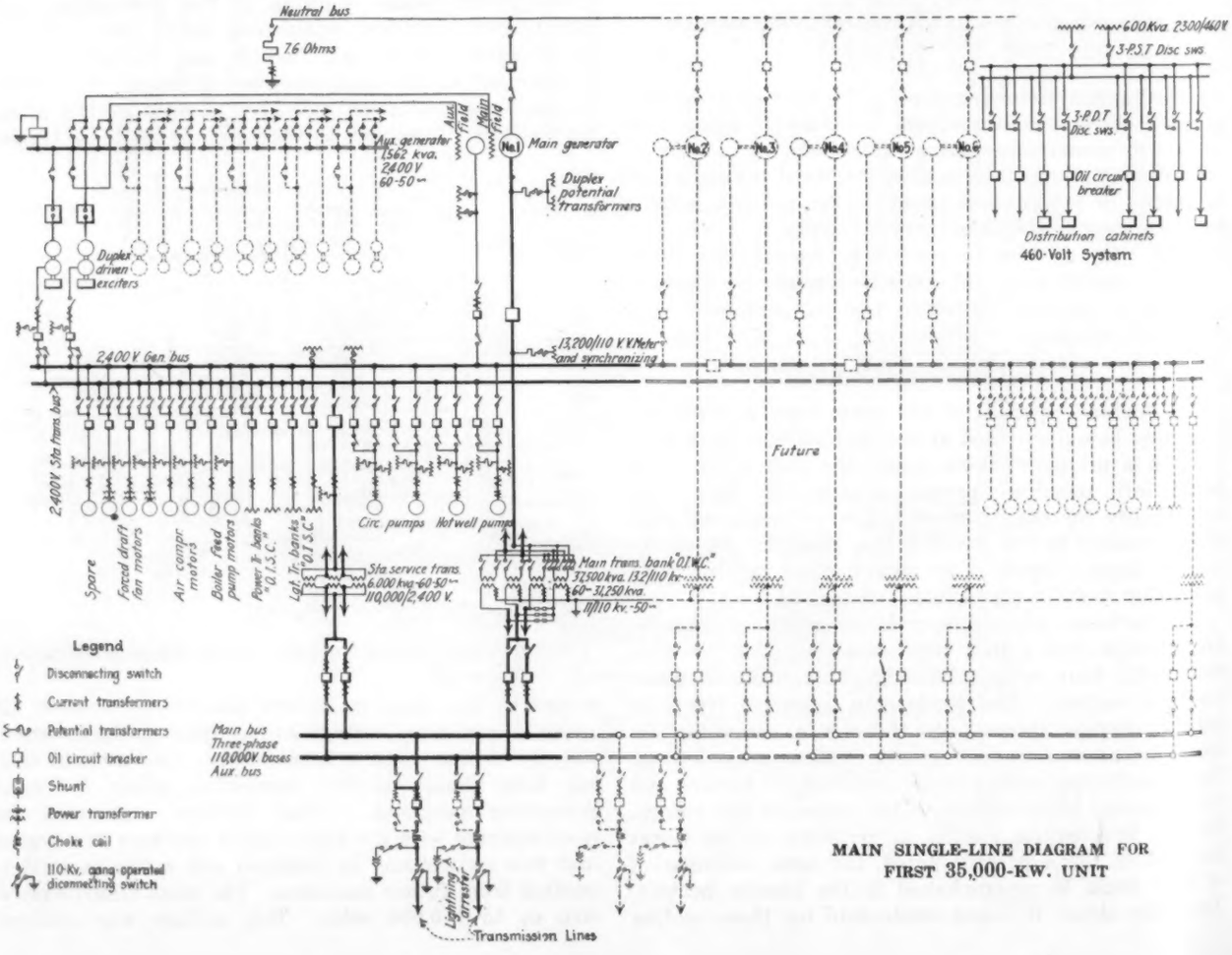
mitted to Los Angeles, it was practicable to omit all buses at generator voltage and connect the generators directly to the main transformers. One switch only has been placed in this connection, solely for synchronizing purposes. After further experience in synchronizing with the high-tension breakers it is hoped that this switch may be removed and a similar switch omitted from future machines. The main transformers step up to 110,000 volts. This voltage was selected







ABOVE—GENERAL VIEW OF TURBINE ROOM WITH FIRST UNIT INSTALLED
TOP LEFT—OIL CIRCUIT BREAKERS AND DISCONNECTING SWITCHES
CENTER LEFT—110,000 VOLT LIGHTNING ARRESTER AND ROOF BUSHING



MAIN SINGLE-LINE DIAGRAM FOR FIRST 35,000-KW. UNIT

on the basis of one spare in a total of four circuits for the ultimate development. The right-of-way necessarily passes through sections which are highly developed and is consequently very expensive.

The load predictions indicated that a new machine would be needed for the fall of 1925. The Los Angeles Gas and Electric Corporation therefore chose to start the work early enough to permit an orderly, safe and economical rate of execution and leave a margin for protection. The development was started in April, 1924, and the first unit went into operation this month.

From experience at another plant the engineers feel that an average thermal efficiency of 15,000 B.t.u. will be obtained. The investment cost for the completed two-unit station, using the same unit prices for the second unit as obtained for the first, will be $85 per kilowatt, based on the actual capacity of the machines, namely, 35,000 kw. at 80 per cent power factor. While the machine was bought for a nominal rating of 30,000 kw. at 80 per cent power factor, tests have shown that it can be conservatively rated at 35,000 kw., 80 per cent power factor. The cost, using the 30,000-kw. rating, is $100 per kilowatt.

This project has been directed by A. B. Day, vice-president and general manager of the Los Angeles Gas and Electric Corporation, assisted by H. J. Kister, manager of operation and construction, and J. G. Rollow, electrical engineer. Dwight P. Robinson & Company, Inc., acting as agents, have executed the design and construction of the power station, the transmission lines and the substation connected therewith.

Electrical Demand in Belgium Growing

THE demand for electrical energy in Belgium is growing constantly, not only in the larger towns, but in communes, villages and rural territory. The connected load of seven of the leading utilities increased from about 278,000 kw. in 1923 to more than 341,000 kw. in 1924, a large percentage of the increase being for power purposes.

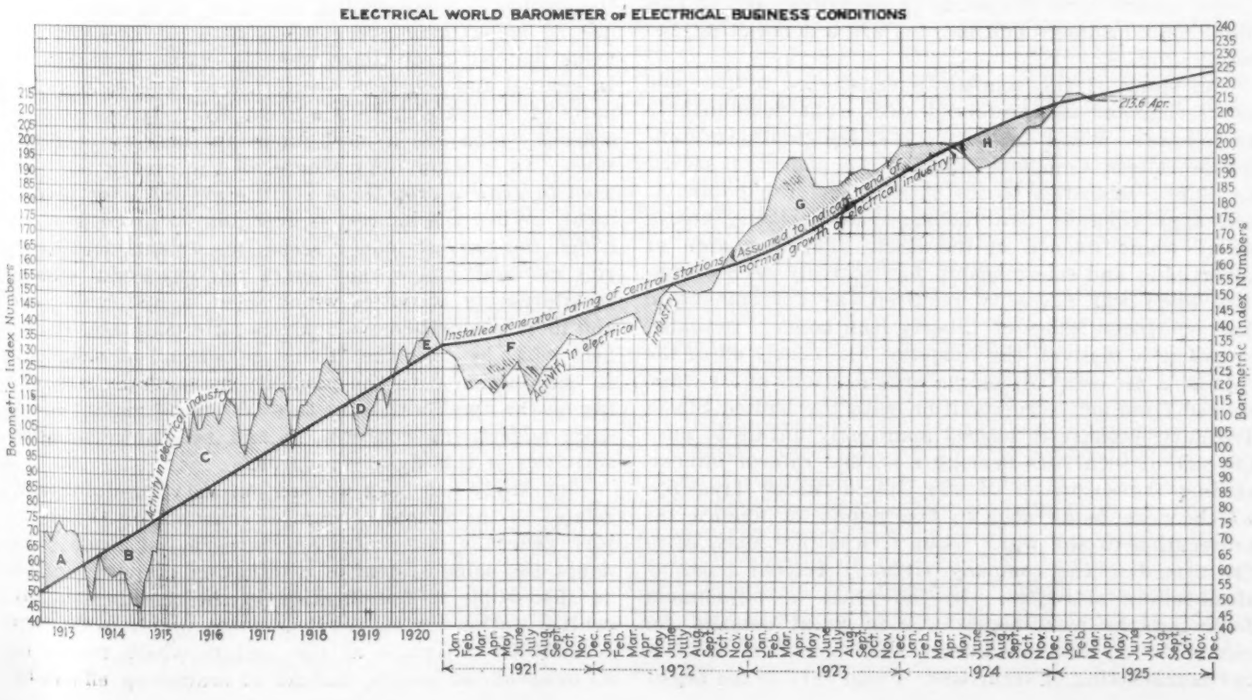
High-tension lines of 50,000 volts and 70,000 volts are being extended rapidly to interconnect the various parts of the systems. The largest company, the Société Intercommunale Belge d'Électricité now has eight generating stations, which, after additions now under construction, will have a capacity of 180,000 kw. Although Belgium is a relatively small country, several of these companies have distribution systems of more than 600 miles of lines, one of them serving more than ninety towns and villages.

April Operations 7.2 per Cent Above Those of Last Year

PRODUCTION figures upon which the "ELECTRICAL WORLD Barometer of Business Conditions in the Electrical Industry" is based indicate that April witnessed a slight decrease in activity. A large number of the primary industries which are considered as indicative of general industry activity were operating several per cent below the estimated normal during April, and this is reflected in the activities of both the electrical industry as a whole and of the central-station branch of the industry.

During April the electrical industry as a whole was operating at 2.8 per cent below the estimated normal for the month. In March it was operating at 1.4 per cent below normal. The estimated total operations of the electrical industry during April, however, were 7.2 per cent above the operations in April of last year, owing to the inherent growth of the industry.

These figures on activity bring to the front one of the outstanding characteristics of the electrical industry. In most industries activity below the normal means production below that of the previous year. But the electrical industry is growing so rapidly in all its branches that a slight subnormal activity may still result in a production of energy and of electrical appliances and supplies well above the production experienced by the generating and manufacturing companies during the year previous.



Publicity and Stock Sales

Advertising Must Be Used at Psychological Time — Concentration of Activities at Money Centers Important—Proper Distribution of Publicity a Vital Factor in Achieving Success

By CHARLES HESTON PEIRSON
Director of Publicity Southern California Edison Company, Los Angeles

SALESMANSHIP and publicity, or publicity and salesmanship, must do team work in double harness to make the popular ownership of public utility securities a permanent and practical success. They are so closely interlocked that no comprehensive campaign for stock sales can be conducted without associating them as dominating factors. Invited to discuss the subject of "Publicity and Its Relations to Stock Sales" from the standpoint of publicity director, I must declare at the outset that I firmly believe that the best possible publicity without a trained and efficient sales organization would be doomed to become "as sounding brass and a tinkling cymbal." Back of all efforts for publicity and advertising there must be a live sales organization if the sale of conservative securities of the non-speculative class is to be successful. While advertising bargain-day propositions in stocks in which the speculative element constitutes the attractive factor may bring direct results, the sale of conservative securities such as those of public utilities to the careful investor involves a thoughtful transaction between the seller and the buyer. In almost every instance such sales are in the end made by an experienced salesman, and advertising brings only a small proportion of the buyers to the counter.

HISTORY OF EDISON CUSTOMER OWNERSHIP

In the desire to be specific rather than general, this discussion will be confined to the activities of the Southern California Edison Company in placing its junior securities in the hands of the public, and of this public its consumers and patrons are a dominating element.

The story of the company's experience in the sale of its common and preferred stock runs substantially as follows: When in July, 1917, the Southern California Edison Company adopted the policy of selling its junior securities to its patrons and the public, it had approximately two thousand stockholders, nearly all of whom resided in the East. The campaign of advertising and salesmanship had scarcely been organized when war necessity required the government to float enormous issues of Liberty loan bonds. Actuated by patriotic motives, the company, like nearly all of the "hundred per cent" American organizations of its class, retired from active competition with the United States Treasury, because it seemed manifestly unfair to push the sale of securities bearing a normal rate of interest against the securities of the United States Treasury, which were being sold to the public to finance the prosecution of the war. Thus it was that until after the armistice the company virtually retired from all stock-selling activities. In the years of adjustment following the war money was in great demand for rehabilitation and conditions were generally adverse to the marketing of securities. From 1917 to the beginning of 1921 the Edison company had obtained only 4,000 additional stockholders, or a total of 6,000.

With the return of normal conditions, and with a seasoned organization of salesmen, the company then began its actual selling activities, adding 18,000 new stockholders, most of whom were consumers, and it ended the year 1921 with a total of 24,000 individual stockholders. In 1922 this number was increased to 48,000 stockholders, in 1923 to 64,000 stockholders and the year 1924 closed with 70,103 individual stockholders on the books. Of these at least 90 per cent are consumers of the company's product, either by direct meter connection or through the medium of some of the organizations that purchase energy at wholesale and distribute it to the consumer. Since 1917 the total sales of junior securities have amounted to $60,000,000.

With approximately half a million meters supplied by the company either at retail or wholesale, the acquisition of more than 70,000 stockholders is regarded as a reasonably good start; but the company looks upon the saturation of the consumer-ownership field as something in the very remote future. It is, however, constantly endeavoring by more intensive analytical study, based upon eight years of experience, to keep the volume of stock sales on the increase as well as to keep the sales cost down.

Many years ago the Edison company adopted the plan of purchasing advertising space in annual blocks which can be used in such quantities and at such times as is most advantageous. This plan fits in admirably with the company's stock-selling activities, as it permits the use of advertising space when it is of the greatest value instead of at times when its value is negligible. In central and southern California as well as in other parts of the state there is a great diversity of cropping seasons which has a most important bearing on stock sales. In a community where all the money is being used to grow a crop there is little available for investment. When the harvest is over and its proceeds come home, the harvest money seeks investment. Our security manager has worked out a few successful studies in alternating activities which seem to justify further and more comprehensive analysis. He maintains in the field what he calls the "flying squadron" of salesmen. In conjunction with the publicity manager he is working on the amplification of this system by making stock sales advertising conform to and be coincident with activities of this flying squadron.

This study has been worked out very carefully as it relates to the fourteen counties constituting the territory generally designated as southern California. No doubt the same system of alternating activities would be susceptible to classification in the territory of any central-station company. It amounts simply to this—to concentrate activities at the centers where money is, so to speak, at leisure, instead of scattering efforts by

covering territory where capital is engaged in the requirements of production. Naturally it follows that by shifting large-space advertising to stimulate activities of the stock sales department in conformity with the "prospect peaks" in the rotation of the seasons advertising has much stronger pulling power than it would have if dribbled out in the communities where all of the money of the people is in demand for the conduct of their every-day transactions.

In our desire to accumulate exact data upon which to base advertising appropriations and concentrate sales activities we have prepared charts of each of the districts into which the service territory of the company is divided. These show the number of meter connections, the total circulation of newspapers within the district and, so far as possible, the financial status of the district and the number of company stockholders. These statistical groups are worked out in percentages, each as relating to the others—as, for instance, the total newspaper circulation in its ratio to the number of stockholders. This enables the publicity manager to reach valuable conclusions as to the relative drawing power of newspapers in various localities, and it is thus obviously valuable in determining where it is most profitable to purchase space.

It has always been our plan to make our advertising constructive. Its dominating note has always been "Be a partner in the utility which provides your electric service," or "Let your power stock dividends pay your power bills." We are always striving to get away from the catch phrase, the "solving sentence," the platitude and the slogan which advertising adventurers have worn threadbare and to substitute constructive ideas which will stimulate constructive thought and cause the reader to apply the great principle of customer ownership to his home and to his business.

PUBLICITY AND STOCK SALES—STOCK SALES AND PUBLICITY

The writer is frequently asked these questions: "What effect has publicity on stock sales?" "What effect have stock sales on publicity?"

To the first question the most definite answer that I can make is to quote our investment manager, who says: "It is only once in a blue moon that one of my salesmen has to sell the Southern California Edison Company to a stock 'prospect.' Advertising and news of our achievements have so thoroughly informed our public and permeated our community regarding the company, its projects and its service, that the salesman's task is largely a strictly business transaction. It is much the kind of a transaction that would take place between a salesman and a customer who is deciding upon the purchase of a standard article."

It is the salesman, however, who in the majority of cases closes all security transactions. It is only in rare instances that we are able to trace any such results to advertising as would be found in the cases of a mail-order house.

The effect that stock sales have on publicity is a most interesting phase of our activities. The 170 newspaper publishers in the territory served by the Edison company are all included in the annual advertising appropriation. Edison stockholders are as numerous among their subscribers as the stockholders in their mutual irrigation companies, their citrus associations or their walnut growers' associations, and consequently our news ceases to be regarded as a foreign activity and becomes intensely local, because it has a personal and vital interest to the editor's own constituency.

Big construction projects are naturally of state-wide interest and are sometimes world news. The stockholder of the company expects to see the progress of these projects related in his local paper. But big construction projects are too much like "angels' visits" to be relied upon as a constant source of news. Stock sales and financial activities, on the other hand, are so constant that they can be reduced to a news routine.

We always make a feature story of our annual budget. A month or two later we split the budget appropriation into the appropriations for construction and betterment in each of the 250 towns served by the company, making each an individual local story. An appropriation of several hundred thousand dollars is as good a story for a small town as a new court house, and these "split budget" stories usually carry a seven-column or eight-column banner-line head. Then there is the annual meeting of the stockholders, which is attended by groups of people from the localities where large blocks of the company's stock is held and is consequently a first-class local story. Four good local stories are always available based upon the payment of quarterly dividends. We have so many stockholders in these small towns that the arrival of Edison dividend checks is of interest to the banker and the merchant as well as to the stockholders who receive them. Sometimes we work these out so as to show just how much Edison dividend money will reach a town on a certain day. These stories show the people of the community that the corporation is not solely engaged in taking money out of their town in the form of bills for light and power, but is returning money to the consumers in dividend checks.

Each day of a long life which has been exclusively devoted to writing and disseminating the printed word adds to my belief that publicity is the great dominating medium by which the people *en masse* can be enlisted in the public ownership of the utilities which serve them—the co-operative movement in which we are all engaged. I wish to emphasize and underscore dissemination and distribution of publicity, for that impresses me as the great problem involved. Distribution is to publicity exactly what transmission is to electricity and what transportation is to commerce. Without a practical distribution system the best publicity mill that ever ground out copy is a power house without a distribution system. Scarcely a week passes without some applicant, young or old, with a fine store of qualifications, asking me for a job to write publicity matter. They all want to sit at a desk and be "generators" and let some one else peddle their product.

This question of the distribution of news is certainly a big question. It is one of the most intricate of problems. None of us has mastered it, and very few have even given it superficial attention. The largest and best publications in the world has at its very best only its own readers. At its very best it reaches only a very small precentage of all the readers within the sphere of its circulation. Assuming that the best and most influential paper in any community stood 100 per cent for the theory that the patrons of a public utility should be owners of its securities, how about all the other papers in the territory? How can the press of a large region be served with good, fresh, clean-cut, non-propagandist, legitimate news that will convey to the entire reading public the true story of the achieve-

ments of the electrical industry? The question is as involved as the problems of engineering, transmission, rate regulation and finance. How many power company managers have given this problem a passing thought? I submit this as a subject meriting the attention of the best brains in the industry and of the most experienced and highly trained minds in the field of publicity. Its correct answer will make for absolute co-operation between consumer and producer, and co-operation is the answer to anarchy.

Letters from Our Readers

The Fynn Motors and a Predecessor

To the Editor of the ELECTRICAL WORLD:

The subject of power-factor correction of induction motors has lately received a great deal of attention. Recent technical and trade literature contains numerous references to the so-called "Fynn-Weichsel motor," "Fynn motor, form No. 1," "Fynn motor, form No. 2," etc. These are all of the synchronous induction-motor type, and in one of his papers Mr. Fynn states that he has devised a "series" of such motors for the purpose of power-factor correction. It is quite obvious that until very recently Mr. Fynn must have felt that the synchronous induction type of motor furnished the best solution to the problem.

However, in the ELECTRICAL WORLD for April 18 Mr. Fynn describes a non-synchronous machine which he now believes is a better solution than the synchronous induction type. This non-synchronous motor, which he terms the "new machine," differs from the ordinary squirrel-cage motor only in that a very simple phase-compensating circuit is provided which includes a small commutator on the secondary. Mr. Fynn enumerates several advantages of this type of motor and concludes: "It is cheaper, lighter, far more rugged and much simpler than the corresponding synchronous induction motor."

About a year and a half ago the writer submitted a paper to the A. I. E. E. entitled "The Rotating Magnetic-Field Theory of Alternating-Current Motors." This paper was published in the February, 1925, issue of the *Journal*, and I wish to make a quotation from a section of that paper under the sub-heading "Power-Factor Compensation" (page 177).

"In Steinmetz' 'Theory and Calculation of Electrical Apparatus' (pages 52-92 and 379) are discussed a number of methods of power-factor compensation. The simplest and most economical of the various methods proposed appears to be the so-called Heyland motor. In addition to the ordinary squirrel cage, the rotor of the Heyland motor is supplied with a compensating winding connected to a commutator and usually placed in the same slots as the rotor bars. By means of brushes bearing on the commutator a voltage of suitable magnitude and phase is impressed on the compensating winding."

It is obvious that the motor described by Mr. Fynn can differ from the one described by me only in the particular method of impressing the voltage on the commutator, but this has in no wise any bearing on the basic idea, which dates back probably twenty-five years or more.

It is rather surprising that an engineer of Mr. Fynn's analytical ability should devise a whole series of the synchronous induction type of motors before concluding that a non-synchronous machine offers a better solution to the problem of power-factor correction. However, it is gratifying to me that he finally came to the same conclusion which I arrived at almost immediately upon commencing the study of the subject of power-factor compensation.

K. L. HANSEN,
Electrical Engineer.
Milwaukee, Wis.

Expostulation from a Horrified Reader

To the Editor of the ELECTRICAL WORLD:

In your issue of April 11, in an article entitled "Unusual Lighting Installations," some remarkable lighting fixtures—or do you prefer "luminaires"?—are exposed to horrified inspection. After reading the article for the second time I came to the conclusion that it was not meant to be funny and that the word "freak" covering the last two paragraphs was not intended to refer to more than two of the modern lighting devices described.

To an old reader of the ELECTRICAL WORLD—long before it was the ELECTRICAL WORLD, in fact—it seems a pity that you would lend your valuable pages to a description of monstrosities of this nature. I refer to the illustration of the primitive and broken-kneed gallows on the first page, the sign sprawling across the mountainside with loud yells at the top of the second, and all the freaks shown in the lower photos, for the lighting standard at the building entrance is nearly as "wrong" as any of the rest.

One wonders how these things get done and how it is they don't get blown up by anti-vice societies or something. Individuals who are allowed to express themselves in this way ought to get into serious trouble with the N. E. L. A. or some such body! It is not my purpose to explain "what's wrong with this picture" in each case, as probably nine out of ten of your readers will readily appreciate the objectionable features of each particular offence.

J. A. REYNOLDS.
Cia Agricola y de Fuerza Electrica del Rio Conchos, S. A.,
Camargo, Chihuahua, Mexico.

Dye Tests of Drainage Before Building Hydro Plant in Cave District

THE Louisville Gas & Electric Company is carrying out a thorough investigation of the country along the Green River in Edmonson County, Kentucky, 75 miles from Louisville, in connection with its application to the Federal Power Commission for a preliminary permit to develop hydro-electric power along the river. The site of the project, which may prove capable of developing 50,000 hp., would be near the Mammoth Cave in a territory honeycombed by other smaller caves which have never been thoroughly explored. The object of the survey is to define clearly the drainage area of the underground streams and determine the possibility of the river dam being bypassed by the underground rivers.

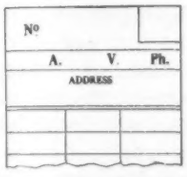
Dye tests were used to trace the water drainage. Sodium fluorescin was placed in the water at various points in the drainage basin, and men were stationed at all springs and along the river to determine the course the water followed. The caves and underground channels were also mapped and levels carried wherever possible. The great care which must always be taken by a utility before undertaking a hydro-electric development was, if possible, increased in this instance owing to the unusual character of the territory where it is purposed to build the plant.

Central Station and Industrial Practice

Keeping Periodic Tests Up to Date

By W. F. WALSH
Meter Supervisor Kingston (N. Y.) Gas & Electric Company

A VERY important and compact system of keeping track of periodic meter tests using a minimum of filing space is employed by the Central Hudson system of gas and electric companies. The basis of the system is shown in the acompanying illustration. This card is 2 in. wide by 4 in. long and gives the meter number, ampere capacity, voltage, phase, address at which the meter is installed and in the space marked off in the upper right-hand corner the interval of test in number of months. In the space provided below these notations the date of each test as it is made is placed.



FORM FOR PERIODIC TEST CALL-UP

One card is made out for each of the 8,000 meters on the company's lines. All the cards are then filed in a cabinet, the drawers of which are divided into three sections, allowing the filing of three rows of cards. Monthly markers are used under which the cards are filed according to the month in which the meters are to be tested, whether the period of test be six, twelve, eighteen, etc., months.

In order to determine readily the size of testing apparatus required for the various tests as they come due four colors are used. White cards are for 110-volt and 220-volt meters with capacity of 25 amp. and lower, salmon-colored cards for meters between 25 and 50 amp., yellow for meters between 50 and 100 amp. and blue for larger meters, transformer meters or meters requiring special test apparatus not normally carried.

For the test itself a special pad is used. One section of this pad is for the detailed test data and results, and on a stub attached to this he fills in the data necessary for the public service commission report. The clerk notes the date of test on the test pad and places it on the card. Then the card is advanced in the file to the month when it is next due for test. The detailed test form is filed in a folder carrying all the information on that meter, while the other is used in the report referred to, and which must be compiled at regular intervals.

In case a meter location is changed or a meter is replaced, the date of last test can be found in the meter history folder. Then, knowing the interval of test, the small card can be located in its file.

Although this system of keeping track of periodic tests has only recently been instigated by the Central Hudson system, its advantages in several instances have already been noted.

Measuring Power Factor

Apparatus for Recording the Average in Industrial Plants Reduces Probability of Error of Temporary Connections to a Minimum

By L. D. PRICE
Division Meter Chief Public Service Electric & Gas Company, Paterson, N. J.

IN ORDER to provide a record of the average power factor at which large power consumers are operating, periodic power factor investigations must be made. Variations in voltage and phase make it necessary to develop a compact piece of apparatus to meet these variations and also to reduce the probability of error in connection to a minimum. The assembly of the apparatus described here was developed by the writer to be used in conducting such investigations.

The instruments used are integrating and recording kilowatt-hour and reactive kilovolt-ampere-hour meters. Westinghouse type "Double R-A" and the new type "R-I" meters are used, the former giving charts and integrated readings of kilowatts and reactive kilovolt-amperes and the latter giving kilovolt-amperes and kilowatts simultaneously on one chart. The diagram of connections is shown in Fig. 2. Colored seven-conductor cable for identifying current and potential leads is brought from the customer's seven-pole testing switch to a similar switch mounted with the test set. This seven-pole switch consists of three single-pole switches in the potential circuit and two double-pole short-circuiting switches in the current circuit.

The instruments used are rated at 110 volts, as all primary metered installations have 110 volts in the instrument potential circuit. However, many customers are metered secondary at 220 volts. A three-

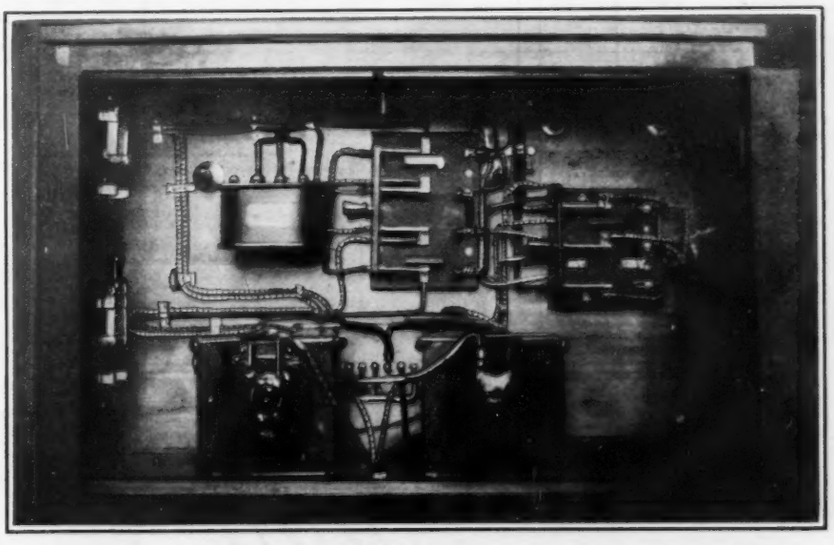


FIG. 1—APPARATUS COMPLETE FOR TWO-PHASE OR THREE-PHASE TESTING

pole double-throw switch with the blades connected to the feeding potential circuit, one side connected to the primary side of two 220/110-volt potential transformers and the other side running straight through, cares for either of the above conditions.

The potential circuit of the reactive meter must be so arranged that the potential will lag the current by 90 deg. This is accomplished in two-phase work by staggering the potentials relative to the currents—that is, "A" phase potential acts with "B" phase current and vice versa. For three-phase, a standard reactive compensator is used to procure this displacement of voltage (see Fig. 3). The potential coils of the reactive meter are connected to the blades of a four-pole double-throw switch, one side of which is energized through the reactive compensator and the other side through staggered potentials. Thus the switch is thrown in the first position for three-phase installations and in the second position for two-phase.

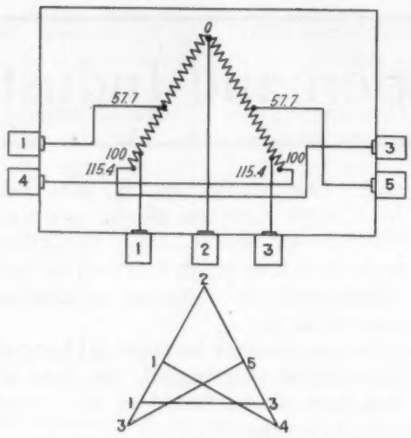


FIG. 3—THREE-PHASE COMPENSATOR

Reverse phase rotation and leading power factor cause the reactive meter to rotate backward. In order to ascertain which condition exists, a phase sequence indicator consisting of two lamps and a highly inductive coil connected as shown is inserted in the potential circuit. Two double-pole double-throw switches are placed in the reactive meter potential circuits to reverse the polarity of the potentials in case of reverse phase rotation. These switches are in a predetermined position for a standard phase rotation so that when the reactive meter runs backward with the switches in this position, the indicator shows whether the phase rotation is reversed or the power factor is leading.

The entire apparatus is mounted in a wooden cabinet approximately 5 x 3 ft., with a partition dividing the cabinet vertically in the center. The meter and shunting switch are mounted on the front face of the partition, and the various switches, transformers and wiring are on the reverse side. Double swinging doors with locks are provided to make the instruments accessible only to authorized employees. Fig. 1 illustrates the cabinet.

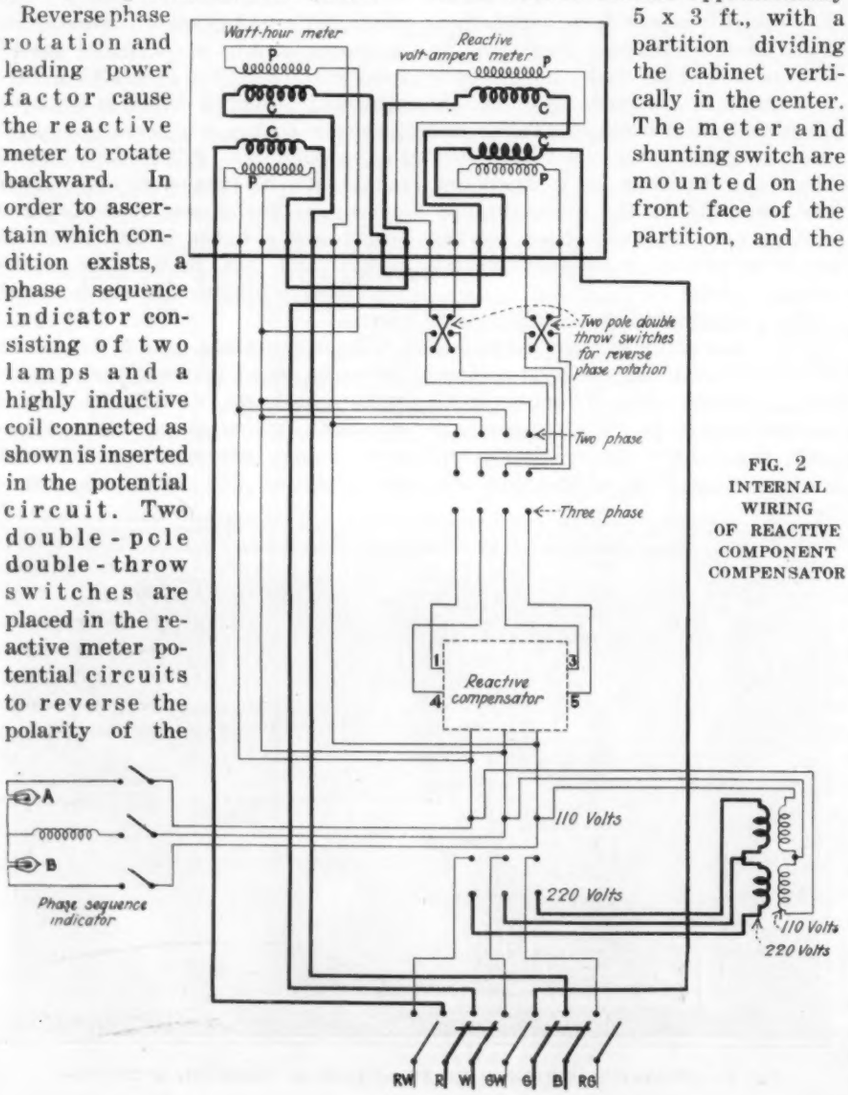


FIG. 2 INTERNAL WIRING OF REACTIVE COMPONENT COMPENSATOR

"Shooting" Trouble in Kansas

BY F. E. BARR
Distribution Superintendent Kansas Gas & Electric Company, Wichita, Kan.

TWELVE "trouble shooters" in charge of a foreman handle all electric and gas trouble calls on the Kansas Gas & Electric Company's system in Wichita. Two dispatchers or supervisors receive and route the calls. The "trouble shooters" start from the main office and call in by telephone periodically. As many calls are to replace fuses, the trouble men always carry cartons containing three fuses, which they offer the customers for twenty-five cents. The "trouble shooters" also take care of street-lighting trouble, report line trouble and disconnect services where fires occur.

To afford ready communication, arrangements have been made with a local taxicab company to use its telephones, and also with the telephone company to use terminal boxes in outlying districts where pay telephones are few and far between.

If a "trouble shooter" cannot handle the trouble assigned to him, he advises the supervisor regarding the nature of the trouble, and he, after consulting with the electrical foreman, calls the person who can handle it. The addresses and telephone numbers of all persons called upon frequently are kept handy.

To expedite restoration of service when interrupted by transformer trouble, emergency transformers are provided, mounted on trailers surrounded with wire fence, which can be hauled to the desired point and tapped onto the primary line and customer's service. Two sizes of emergency transformers are provided—15 and 50 kw.

It is now planned to divide Wichita into four districts besides that covered by the main office and to provide reporting points.

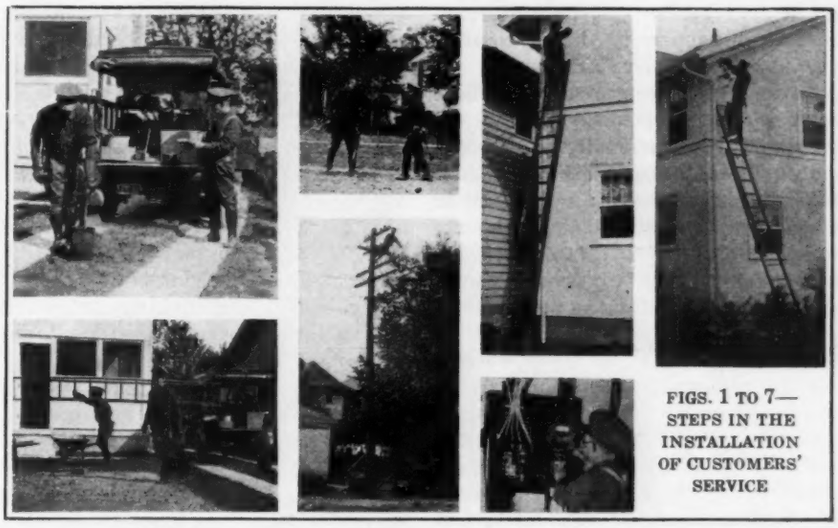
Most of the "trouble shooters" use Ford coupés at six cents a mile. Among the equipment carried are: Fuse plugs, stick to replace street lamps, small repair tools, meters for studying low-voltage complaints, and adapter for connecting demand meter to cut-out plug.

Installing 28 Services Daily with Two Men

JUST by co-ordination of work and without rushing, a two-man service installation crew employed by the Dayton Power & Light Company has been able to install as many as twenty-eight services in one day and has averaged sixteen services a day during the past year. The average is so much lower than the maximum because on some days during the slack season there were not enough services to keep the crew busy and other work such as small maintenance jobs was done. In addition to running services this crew also handles all "disconnects" and "reconnects" that are ordered by the credit and collection department.

The work of connecting services usually involves running service wires from the nearest pole to the customer's house, connecting them to the circuits at both ends, installing and connecting the meter, and testing the completed circuit. Service orders, containing such information as the name and address of customer, kind of service required, meter location and so forth, are handed to the service crew each morning and noon. The foreman routes cards as to location and places the meters for the jobs on a special rack in his truck. Besides the meter rack, the truck carries an extension ladder, a specially supported wire reel, a salamander and solder pot, and other equipment usually required to install services.

Upon arriving at a job, the foreman studies his service card and meter-record slip to ascertain requirements and the helper removes the meter requested from the rack and places it on the end gate of the truck so that the foreman can record the necessary data on the service order, Fig. 1. While the foreman is doing this, the helper gets out the salamander, pours about a gill of kerosene on the asbestos pad at the bottom, lights the fire and hangs the solder pot and ladle over the flame. After making a record of the meter data, the foreman takes the extension ladder to the point of service entrance, Fig. 2. In the meantime the helper has taken one end of the service wire from the reel and proceeded to the nearest pole with facilities for secondary taps. When he arrives there, the foreman cuts the wire at the reel, taking the second wire toward the pole, Fig. 3. The helper meets him half way, receiving the second wire and, returning to the pole, climbs it, carrying both wires with him, Fig. 4. While the helper is connecting the secondary wires and service wires, Fig. 5, the foreman is installing the house brackets and temporarily fastening the service wires thereto. He then takes the solder pot to the pole, hooks it on to the helper's hand line, waiting for the helper to solder the joint and return the pot. The foreman replaces the solder pot on the salamander and then takes the meter to the point of installation (where a meter board has previously been installed), mounts it with the aid of a template, Fig. 6, tests the meter-box wiring, connects the meter and seals the switch box. While he is doing this, the helper, who has come down from the pole, completes the splices at the house and solders the joints, Fig. 7.



FIGS. 1 TO 7—STEPS IN THE INSTALLATION OF CUSTOMERS' SERVICE

The final clean-up is a matter of a few seconds, so that a new service is installed within an average time of fifteen minutes, not allowing for travel between installations. However, as previously pointed out, the calls are routed, thus reducing travel time to a minimum.

Conduit Sizes for Wires and Cables

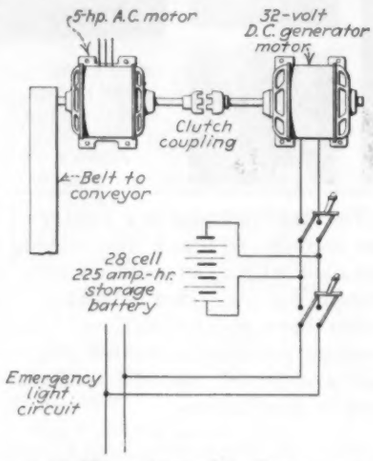
FOR running wires and cables into conduit 100 ft. or less in length the Utica Gas & Electric Company has adopted the figures in the accompanying table as its standard practice. This table is particularly valuable for design work or when a new installation is being drawn up. The ampere capacity given is for 600-volt rubber-covered wire.

CONDUIT SIZES FOR WIRES AND CABLES FOR RUNS LESS THAN 100 FT.
Ampere capacities for the wires given are for 600-volt rubber-covered wire.

Gage, B. & S.	Circ. Mil.	Amp.	Diam.	Number of Wires																		
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
14	4,107	15	½	½	½	½	½	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	1	1
12	6,530	20	½	½	½	½	½	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	1	1	1	1
10	10,380	25	½	½	½	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	1	1	1	1	1	1	1
8	16,510	35	½	½	¾	¾	¾	¾	¾	¾	¾	¾	¾	1	1	1	1	1	1	1	1	1	1	1
6	26,250	50	½	¾	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	41,740	70	¾	¾	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	66,370	90	¾	¾	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	105,500	125	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2/0	133,100	150	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4/0	211,600	225	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
...	250,000	250	1¼	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
...	300,000	275	1¼	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
...	500,000	400	1½	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
...	750,000	525	1½	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
...	1,000,000	650	1¾	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
...	1,500,000	850	1¾	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
...	2,000,000	1,050	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Emergency Conveyor Drive Prevents Interruption

INTERRUPTIONS to electric service supplying conveyor drives in continuous processes are generally of more serious consequence than interruptions to the ordinary production machinery. With modern electrical distribution systems, interruptions are generally highly infrequent, and yet there are certain applications of electric drive where even a very short interruption, occurring only occasionally, may result in considerable loss to the customer. If the value of materials involved in a conveyor or continuous process are considerable, it is often advisable for the customer to provide some emergency drive for the conveyor so



EMERGENCY CONVEYOR DRIVE FOR ELECTRIC FURNACE

as to permit its unloading before the material is damaged.

Such an emergency drive has been designed and installed by engineers of the Coonley Manufacturing Company, Cicero, Ill. Here the conveyor is used to carry enamel ware through an electric furnace and there are at times as much as 260 ft. of conveyor, loaded with ware, in the furnace at one time. With the furnace up to temperature and a failure of the power supply, it would ordinarily be difficult to unload the conveyor before the ware was damaged. Although this customer has experienced only one or two interruptions in a period of a year, he has felt it worth the expense to provide for an emergency drive for the conveyor to permit its unloading before the ware could be damaged.

The emergency drive designed as shown in the accompanying illustration consists of a 32-volt generator which may be connected through a clutch coupling to the double shaft extension of the conveyor drive motor. This generator may be connected to a twenty-eight-cell Edison storage battery and operated as a motor. In the event of failure to the alternating-current motor supply the clutch coupling is closed, the direct-current generator is connected to the storage battery and operates as a motor, driving the conveyor at approximately the same speed as the alternating-current motor would drive it. The storage battery is of 225 amp.-hr. rating and of sufficient capacity to operate the direct-current motor long enough to unload the conveyor. Connected to the same battery is an emergency lighting circuit that supplies current to two 100-watt, 32-volt lamps at either end of the conveyor, furnishing ample illumination to permit the quick unloading of the conveyor.

At intervals of approximately a week, the direct-current generator is connected to the alternating-current motor and driven by it while the storage battery is given a small charge. The installation of this emergency drive has relieved the production engineers of responsibility for possible damage to the ware in case of service interruption and it might be said also that it relieves the electric furnace of the charge of damaged goods that would result from service interruption. Other applications of this type of emergency drive would be on conveyors where failure of the power supply would result in "freezing" of the material in the conveyor in the event it was not unloaded promptly. In such cases the chief expense resulting from an interruption is the labor involved in cleaning out the conveyor and putting it into service again. A comparatively small amount of energy is required to move a conveyor far enough to permit its being unloaded, and it would seem that the scheme outlined above might have many worth-while applications.

Diesel Engine Experience at Ponca City, Okla.

BY J. W. CROW
Superintendent of Water & Light, Ponca City, Oklahoma

ABOUT two years ago Ponca City, a rapidly growing town of 12,000 population, was faced with the problem of handling what promised to be and later developed to be a 700 to 1,400-kw. load, with a plant rated at 1,068 kw. Then the question was what should the new unit be. To install a turbine plant, a new site closer to ample water supply would be necessary. This would mean practically a total loss of the present plant. After considerable investigation a Diesel oil engine, to be used in combination with the present steam equipment, was found to be the solution. The aim was to replace gradually all steam units with oil engines, since such procedure was considered to reduce first cost and make large bond issues unnecessary. The total cost of the engine, which was a 1,250-hp. Nordberg Diesel, was $97,784 installed.

The data in the accompanying tables, taken from records since July 1, 1924, will give some idea of the success of the plan. They do not include overhead expense, labor or maintenance. Separate records of labor, interest, taxes, insurance, etc., are not kept for each engine.

A standby steam plant is used in conjunction with the Diesel engine consisting of three units—one 540-kw. and one 360-kw. Chuse non-releasing Corliss, and one 168-kw.

TABLE I—RECENT PERFORMANCE OF TWO-YEAR-OLD, 1,250-HP. ENGINE

Nordberg Diesel engine rated at 850 kw. at 0.8 power factor

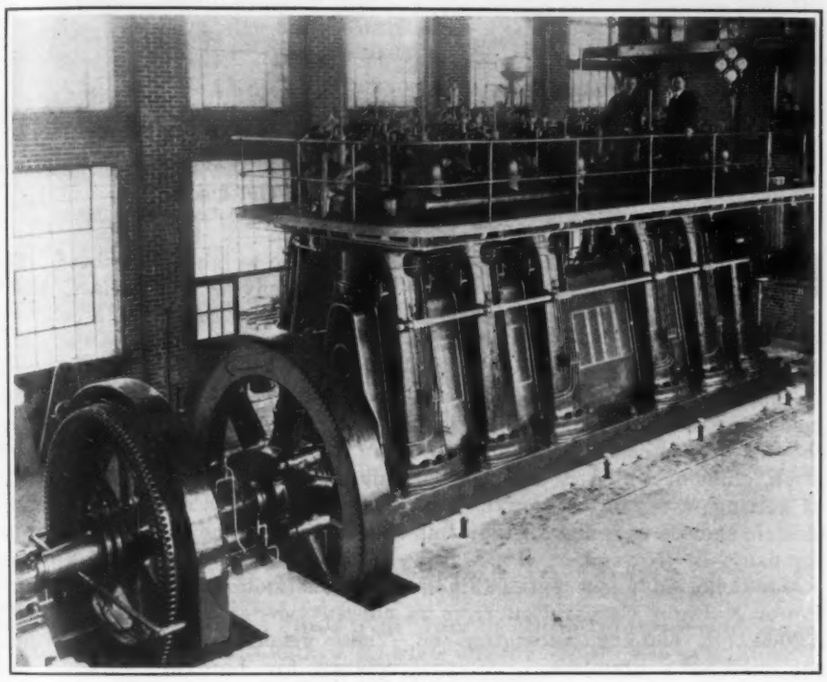
Month	Hr. Operated	Kw.-Hr. Produced	Fuel Oil (Gal.)	Kw.-Hr. per Gal.	Average Cost Gal.	Total Cost Fuel Oil	Lub. Oil, Gal. Cyl.	Lub. Oil, Gal. Engine	Total Cost of Lub. Oil
July	672	421,090	46,473	9.08	$0.0326	$1,515.02	52	252	$168.70
August	663	430,580	46,725	9.23	.029	1,355.03	47	207	146.05
September	662	405,540	43,200	9.40	.029	1,252.80	45	87	75.31
October	656	404,150	44,300	9.12	.0255	1,129.65	42	208	143.75
November	687	409,890	44,030	9.20	.0255	1,122.77	43	271	180.45
December	680	411,760	43,640	9.42	.0305	1,330.92	43	126	94.07

TABLE II—PERFORMANCE OF STEAM STANDBY PLANT

Month	Hr. Operated	Kw.-Hr. Produced	Total Cost Fuel Oil & Gas	Lub. Oil, Gal. Cyl.	Lub. Oil, Gal. Engine	Total Cost of Lub. Oil
July	163	48,700	$1,095.40	18	26	$25.12
August	187	51,548	1,074.21	14	37	29.94
September	181½	55,700	825.20	10	25	23.81
October	250½	85,400	1,058.18	11	48	34.26
November	189	65,300	936.03	10	40	29.80
December	247	85,900	1,035.00	15	78	56.71

Skinner unaflow engine. The results obtained with this plant are given in Table II.

A few comparisons before and after installation of the Diesel, on Feb. 1, 1924, show some very interesting results. The present cost of distributed electricity of 2.146 cents per kilowatt-hour is less than the average cost at switchboard of 2.18 cents per kilowatt-hour before the installation of the oil engine. The average cost for the year ended June 30, 1924, with five months combination steam and Diesel operation and seven months steam operation was 1.748 cents per kilowatt-hour at the switchboard as compared with 2.18 cents per kilowatt-hour for the thirteen months of steam operation preceding that time.



DIESEL ENGINE INSTALLATION AT PONCA CITY, OKLA.

At present it is necessary to operate one steam unit in parallel with the Diesel to take care of peak loads. This lasts about three hours per day and of course makes operation costs slightly higher than that of a 100 per cent Diesel plant. The average load on the Diesel engine is 650 kw.; the power factor averages 92 per cent. It will be noticed from the tables that the fuel cost of operating the steam plant a month is nearly two-thirds that of the Diesel, while it produces only one-eighth the number of kilowatt-hours. The energy for Diesel station auxiliaries averages 8,000 kw.-hr. per month. Since the beginning of operation the Diesel engine has never been out of service for repairs for longer than ten hours. During the last half of 1924 the material expense for repairs was $50. The cost of labor cannot be given correctly, because pistons were pulled and cylinders inspected frequently to ascertain the effect of changing oil, and not through fault of the engine.

The fuel oil used in the Diesel is 24 to 26 gravity, the same as is used in the steam plant. Natural gas is also used in the steam plant. All lubricating oils are furnished by Marland Oil & Refinery Company of Ponca City, Okla. A Sharpless centrifuge for clarifying used oil has cut down lubricating costs.

Another Diesel engine rated at 1,500 hp. is to be installed and more accurate records will be kept.

TABLE III—NET RESULTS OF THE DIESEL-STEAM COMBINATION

Month	Demand, Kw. Ave.	Demand, Kw. Max.	L. F. Per Cent	Total Kw.-Hr. All Generators	Total Operating Cost*	Switchboard Cost, Kw.-Hr.
July	630	1,140	55	469,790	$7,472.92	$0.01591
August	695	1,330	52	482,128	6,550.59	.01351
September	640	1,270	50	361,440	5,625.29	.01218
October	658	1,340	50	489,550	5,710.28	.01166
November	660	1,320	59	475,190	5,688.13	.01197
December	670	1,360	....	497,660	5,828.72	.01171

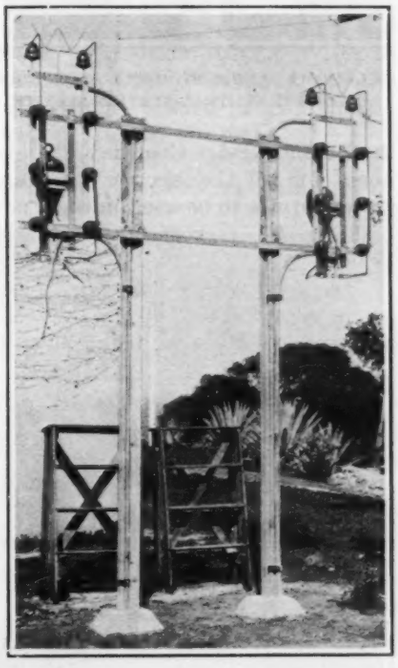
*Includes salaries (superintendent 25 per cent, office 5 per cent), salaries engineers and firemen, renewals and repairs to power plant and equipment, interest on bonded indebtedness against power plant and equipment, insurance on power plant and equipment, depreciation on power plant and equipment, fuel, engine supplies, boiler compound, and various other miscellaneous items.

Removing Defective Bolts and Set Screws

BY HOWARD DAVIES
Davies Battery & Electric Company, Philadelphia, Pa.

VERY often the writer has run across motors in which the bearings are fastened in with a setscrew that is countersunk. The heads have become broken so that it is almost impossible to get them out by the ordinary methods. A method for removing these, which is also applicable to bolts, etc., and which is better than drilling and retapping, is to take a piece of steel rod slightly smaller than the diameter of the head of the screw, flatten it to the shape of a screwdriver bit and place it on the head of the screw. Then send a current through this contact and weld the points together. A small storage battery is sufficient for this. It is then a simple matter to unscrew the screw.

Telephone Protection



THIS type of telephone protection is being used by the Pacific Gas & Electric Company at its Cordelia substation. Angle-iron uprights set in concrete support horn gap, disconnecting switches, fuses and insulating transformers for two private telephone lines. An installation of this type is simple, durable and neat in appearance.

Commercial Activities and Public Relations

Oklahoma Hotel Contracts for Central-Station Power

THE owners of the Mayo Hotel, soon to be completed in Tulsa, Okla., have shown their confidence in the dependability of the local central-station company by contracting with

OKLAHOMA'S NEWEST HOTEL WILL HAVE COMPLETE CENTRAL-STATION SERVICE

the Public Service Company of Oklahoma for all the electric light and power service to be used in their new building, the largest hotel in Oklahoma.

The connected lighting load amounts to 360 kw. The power load amounts to 468 hp. in motors driving ventilating fans, pumps, refrigeration machines and incidental equipment. Direct-current motors totaling 275 hp. operate six high-speed elevators. Provision has been made in the power company's service and in the hotel switchboard for the early installation of a large roof sign and the future installation of electric ranges and bake ovens.

Electric Shovels Lower Coal-Mining Cost

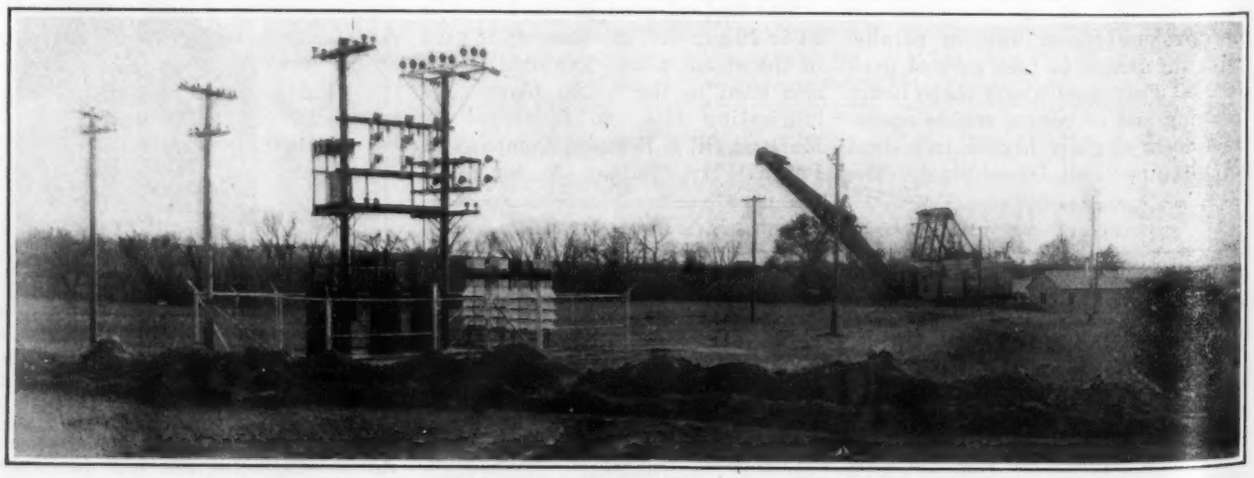
Principal Features of Electrical Installation at Solar Coal Company, Belleville, Ill.—215,600 Kw.-Hr. Used in Four Months

EXPERIENCE of the Solar Coal Company, Belleville, Ill., shows that the operation of electric shovels costs 15 per cent less than steam shovels, that they are more flexible in operation, require less maintenance and eliminate many objectionable features of coal and steam operation, chief of which is the problem of getting water to the shovel. Two electric shovels were installed by this company in November, 1924, the power being supplied by the Illinois Power & Light Corporation from a 33,000-volt, 600-kva. substation on the customer's premises.

Two shovels are in use, one which removes the overburden of rock, clay and foreign material, exposing the seam of coal, while the other and smaller shovel digs and loads the coal into the cars. The large shovel has a dipper capacity of 8 cu.yd. and the small shovel a capacity of 2 cu.yd.

The large shovel is a Marion power shovel, No. 350, with a capacity for removing 2,300 cu.yd. to 3,000 cu.yd. of overburden per eight-hour day. The shovel weighs 400 tons and carries in addition 95 tons of ballast to balance the weight of the boom. The power supply is three-phase, 4,000-volt service by means of a cable extending from the shovel to the power company's substation on the property. The cable passes over a reel on the shovel, which permits its being kept out of the way when moving and the accommodation of the shovel at various distances from the substation. The 4,000-volt, three-phase current supplies a 435-kw. synchronous motor driving three direct-current generators on one shaft. These generators supply individual motors for hoisting, rotating and crowding and are rated at 250 kw., 75 kw. and 50 kw. respectively. There are four direct-current motors on the shovel, two hoisting motors of 137.5 hp. each, one 105-hp. motor for rotating the shovel and one 85-hp. motor for crowding the dipper. Motor speeds are regulated by Ward-Leonard control of generator field current.

Because of irregular operation during the past few months, the operating costs have not been determined as closely as would be possible



600-KVA. SUBSTATION SUPPLYING STRIP MINE USING ELECTRIC SHOVELS

ELECTRIC SHOVEL WITH DIPPER OF 8 CU.YD. CAPACITY MOVES 3,000 YD. OF OVERBURDEN PER DAY

at other times, but approximate figures place the cost of removing the overburden at 5 cents per cubic yard and the cost of loading the coal at 35 cents per ton.

In addition to the electric shovels there are two motor-driven centrifugal pumps used, one of 500 gal. per minute driven by a 7½-hp. motor and one of 1,000 gal. per minute driven by a 15-hp. motor. A motor-driven compressor operating about five hours per day supplies air for drilling coal for blasting prior to its being loaded on the cars.

The installation has used 215,600 kw.-hr. during the past four months with a maximum demand of 305 kw.

Synchronous Motor Drive in Brick Plant

Clay Products Company Finds Synchronous Motor Superior and More Economical—Other Electric Motor Applications Speed Up Operations

BY R. H. TRIEM
Power Engineer Northern States Power Company, Ottumwa, Iowa

A DIRECT-CONNECTED synchronous motor replacing steam engine drive at the plant of the Morey Clay Products Company, Ottumwa, Iowa, has been in operation a sufficient length of time to warrant certain conclusions as to the value of central-station service and synchronous motor drive for a clay products plant.

The Morey Clay Products Company manufactures common brick, face brick, drain tile, building tile and glazed tile. The annual production of the plant is approximately 42,000 tons of burned ware. There are in service fourteen round, downdraft, intermittent kilns and a continuous kiln with a total capacity of 700,000 brick. Electric power is used throughout the plant for handling material, grinding and preparing the clay, manufacturing the brick and tile and conveying the ware from one part of the plant to another. The electrically driven equipment is indicated in the accompanying table. Energy is received at 4,000 volts, three phase, sixty cycle, the customer owning three 37.5-kva. transformers to supply 440/220 volts for small motors and lights.

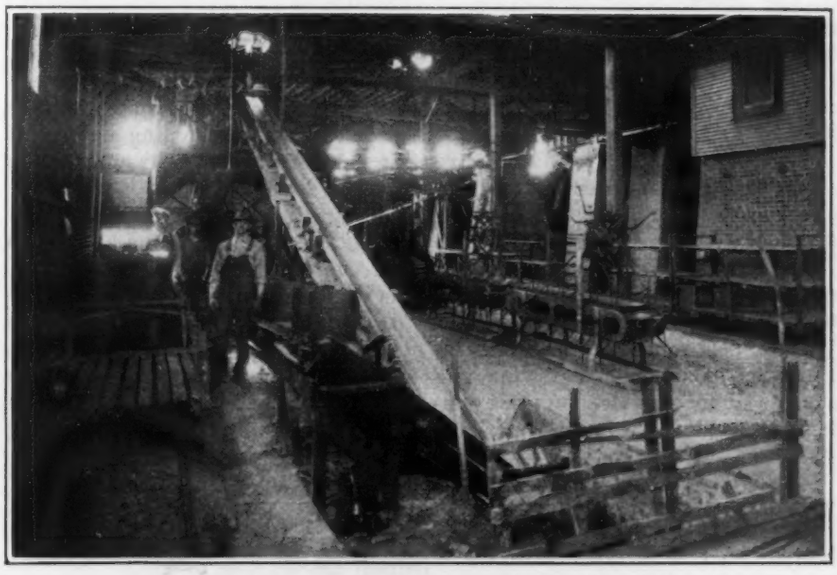
A large room, bricked off in the main building to house the switching equipment, transformers and motor-generator set, is so located that a large window permits the man starting the synchronous motor to watch it while operating the starting switches.

REASONS FOR ELECTRIFICATION

This brick and tile works had for years been operating a steam power plant consisting of four 100-hp. fire-tube boilers, one 200-hp. Atlas non-condensing engine, and one 125-hp. non-condensing engine. About four years ago it was found that neither engine was fully loaded, and so a 40-kw. generator was belted to the larger engine; this furnished power to drive motors which replaced the 125-hp. engine. Later arrangements were made so that all the machinery in the main plant was driven from the line shaft and the generator was used to furnish power to the two trolley lines for the operation of an electric pit locomotive.

Live steam for drying the green brick necessitated the continuous operation of the boiler plant throughout the year. With increasing age of the boilers the allowable working steam pressure was reduced to a point where the engine failed to operate satisfactorily. Faced with the necessity of replacing much of its boiler equipment, the brick company was receptive to a purchased power proposition from the Northern States Power Company and the negotiations resulted in the complete electrification of the plant.

Recent checking of records gives the following operating data:



BRICK PLANT CHANGES TO PURCHASED POWER

Synchronous motor foundation and housing at extreme right, showing ventilating pipes.

All machines, including dry pan (behind pillars supporting line shaft), are driven from line shaft.

Annual production of burned ware, tons	42,000
Annual consumption of energy, kw.-hr.	256,000
Average energy consumption per ton, kw.-hr.	6.1
Connected load, hp.	255
Maximum demand (fifteen minutes), kw.	179
Annual load factor, per cent	16
Average power factor, per cent	94

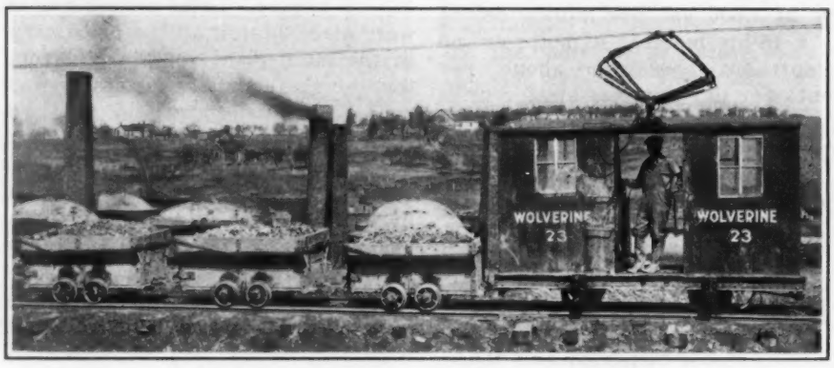
The use of a synchronous motor for the main drive has the following advantages:

Permits direct connection, with resultant saving of transmission losses and expense of maintaining main drive. Increased efficiency in use of power. Savings in power bills. As the company rates carry a penalty for power factors lower than 80 per cent, use of the synchronous motor maintains the power factor of the entire plant well above that figure.

FURTHER SAVINGS POSSIBLE

The savings in operating expenses to date include the time of one man in the power house, reduction in maintenance expense and a marked improvement in production and operating conditions. The absolutely constant speed of the machinery has been of great benefit.

The drier is still heated with live steam coils and requires the continuance of the boiler plant. The boilers are operated at a pressure of 60 to 70 lb. per square inch, effecting a great saving in fuel and maintenance over their former operation at 100 lb. per square inch. The installation of waste heat drying and the use of motor-driven fans, a contemplated change, would permit shutting down the boiler plant at a great saving in fuel and labor. The electric energy to operate the drier fans would be supplied at the lowest step in the rate schedule and would cost less than half the present expense of maintaining the boiler plant.



ELECTRIC PIT LOCOMOTIVE WITH DUMP CARS
Two trolley wires and two separate pantographs are used.

MOTOR EQUIPMENT FOR BRICKYARD

Machine	Motor Hp.	Volts	Type	Remarks
Main drive	225	4,000	Synchronous	200 r.p.m., direct-connected to line shaft. Inclosed in ventilated dust-tight house.
Pit locomotive	15	440	Slip ring	Hauls clay from pit and delivers to dry pans.
Transfer car	7.5	440	Slip ring	Transfers cars from drier to kilns
Kiln unloader	3	440	Squirrel cage	Portable belt conveyor for handling brick around kilns
Line shaft	2	440	Squirrel cage	Blacksmith shop

Remedying Heat Losses in Electric Water Heaters

BY E. N. STEWART
Dayton (Ohio) Power & Light Company

INVESTIGATION of excessive cost in using an electric water heater in a suburb of Dayton, Ohio, shows the importance of proper installation of this device if satisfactory results are to be obtained and high electric bills avoided. The appliance installed was a 3,000-watt, 110-volt circulation-type heater, equipped with thermostatic control, connected to a 100-gal. range boiler and used in conjunction with a fuel-fired heater. The inlet water temperature was approximately 60 deg F., and the thermostat was first set for an outlet temperature of 160 deg. F. When the first check was made on the heater, it was consuming energy at the rate of 0.645 kw.-hr. per gallon of water heated.

As first installed, the water heated by the electric heater was allowed to recirculate through the cold coils of the fuel-fired heater, thereby radiating approximately one-third of the total heat. When rearranged this recirculation was eliminated with a great reduction in energy consumption. Moreover, the tank and piping were not insulated against heat radiation, and because of the large area exposed by a 100-gal. tank and the use of exposed piping there was a large loss from radiation. The tank and piping were lagged and the radiation loss was reduced materially. A temperature range of 115 deg. F. to 140 deg. F. was satisfactory to the owners, and after the circulation and insulation of the heater had been corrected the thermostat was set for this range instead of the original setting of 160 deg. F., which had been required to give sufficient heat at the faucets.

After the changes described above had been completed, the energy consumption dropped from 0.645 kw.-hr. to 0.267 kw.-hr. per gallon, and the bills dropped from $42.50 to $20.05 per month. The use of a 60-gal. tank would reduce the unit energy consumption still further because of decreased radiation and a reduction in the two and one-half hours necessary to bring the water up to temperature in the 100-gal. tank.

Sales Quota Doubled in Stock Campaign

A TOTAL of 12,028 shares of 6 per cent preferred stock of the Ohio Public Service Company, priced at $93 per share, were sold by employees recently in a ten-day customer-ownership campaign, the fourth the company has carried on in a little more than three years. The stock was sold to 4,237 persons, approximately 2,500 being new customers, bringing the total number of preferred stockholders close to 10,000. The original goal of the campaign had been set at 6,000 shares, but the demand for the stock was so great that more than twice that amount was disposed of by the 1,423 employees of the company.

Success of the campaign was attributed to the fact that the employees were organized for the sale along military lines—with general officers, eight divisional officers, forty colonels and 188 captains. Prizes were offered within the divisions and for record sales throughout the territory. Approximately 50 per cent of the stock was sold for cash, while the balance was taken on the company's savings plan.

Employee ownership at Cleveland, Sandusky and Ashland is 100 per cent, and there is an average of 85 per cent in the whole company, according to T. O. Kennedy, vice-president and general manager.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Limiting Possibilities in Steam Plants.—A. L. MELLANBY and WILLIAM KERR.—In this paper, read before the Northeast Coast Institution of Engineers and Shipbuilders, the authors first bring together data on the physical properties of the materials used, taking into account temperature, strength and cyclic variations of stress. On this basis they arrive at 1,250 lb. per square inch and 900 deg F. as the probable limits, which values are therefore taken as the starting point for the thermodynamic considerations that form the main part of the study. The methods of examination are given in full, and the conclusion is reached that the cycle that promises the best ultimate results involves resuperheating at intermediate pressures of 500 lb. and 180 lb. per square inch and includes the employment of about eight extraction feed heaters, equally stepped, on a range of liquid heats up to that corresponding to 1,000 lb. per square inch pressure. With 90 per cent boiler efficiency and 0.5-in. vacuum the computed oil consumption is then 0.495 lb. per kilowatt-hour for the turbine alone, excluding auxiliaries. This, then, may be presented as the ultimate limit in the operation of high-power units under the best conditions in land plants.—*Engineering* (*England*), March 6, 13 and 20, 1925.

Testing of Fireclay Brick with Special Reference to Its Use in Coal-Fired Boiler Settings.—R. F. GELLER.—Following a conference of government representatives, users and producers of fireclay refractories, held at the Bureau of Standards, a voluminous field survey report was obtained and refractories of forty-two brands representative of the product as manufactured in the United States were submitted to an extended investigation in the laboratory. The investigation had been confined to a study of brick used in the settings of coal-fired boilers and to that class of installation in which the so-called first quality of firebrick can be economically used. As a result of this work the qualifications of high-grade refractories for coal-fired boiler settings are believed to have been established. It was found that a close relation existed between data obtained in the endurance, reheating, quenching and softening-point tests, and that the behavior of brick in these tests depended to a remarkable extent on the chemical composition. This bulletin is about forty pages long with twenty illustrations.—*Technologic Papers of the Bureau of Standards No. 279.*

Generation, Control, Switching and Protection

High-Voltage Characteristics of Gaseous Insulators.—FRANK M. CLARK.—The paper is a twelve-page résumé and includes a considerable amount of data assembled from various sources, with references to original publications. Topics included concern the effect of electrode material, with a table of sparking potentials for very short gaps between various metals; influence of electrode shape, effect of spacing, variation of dielectric strength with temperature, pressure effects, time factor, effects of frequency and of humidity, and a table of minimum spark potential and of mean free path for several gases. The paper concludes with a discussion of theoretical considerations.—*General Electric Review*, March 1925.

Use of Frequency Changers for Interconnection of Power Systems.—H. R. WOODROW—The paper is based on the experience of the Brooklyn Edison Company in holding together its 25-cycle and 60-cycle systems by means of a 35,000-kw. unit. It is pointed out that a tie having a maximum synchronizing capacity of double the permissible fluctuation of load should hold the system together.—*Journal of A. I. E. E.*, April, 1925.

Standard Busbars.—The British Engineering Standards Association has issued a new British standard specification for busbars and connections. It refers to quality of metal, limits of temperature rise and current density, joints between conductors and recommended sizes of flat and round bars both of copper and aluminium.—*British Engineering Standards Association, London, England.*

Transmission, Substations and Distribution

Three-Phase High-Tension Line.—R. GRANN.—This article gives very detailed information of a 20-mile double three-phase line built recently in Austria. Structural-steel towers about 70 ft. high were used throughout, anchored in monolith cement blocks. Steel-aluminum cables with 35 sq.mm. steel and 60-sq.mm. aluminum cross-section were installed on seven-member sphere-head suspension insulators. A 35-sq.mm. steel cable above the wires serves as protection. Of particular interest is one 1,600-ft. span over a deep valley and a 1,000-ft. river crossing, both made with the regular transmission cables. Extra-heavy towers have been designed for these two spans. The protective steel cable is insulated from the towers at the ends of the line and serves there as an antenna for carrier-current radio communication between power house and substation. The right-of-way of this line is far away from railroads, a fact which made the transportation of building materials very difficult. Lack of adequate highways prohibited the use of automobile trucks, so that only horse-drawn vehicles and caterpillar trucks could be employed. The line was complete within six months.—*Elektrotechnik und Maschinenbau*, April 12, 1925.

Single-Core Armored Cables for Alternating Currents.—G. M. HARVEY and A. H. W. BUSBY.—*Single-Core Lead-Covered and Armored Cables for Alternating Currents.*—W. CRAMP.—The first paper is primarily experimental and contains tabulated data of voltage drop, power losses and sheath currents for various combinations of current, size of conductor, size and nature of conduit or armor, and spacing between the outgoing and return conductor, followed by an analysis of the results. The authors conclude that the inclosing of a conductor carrying current at commercial frequencies need not necessarily involve excessive losses or heating; that heavy-gage sheathing is unsuitable, but that the losses can be kept within reasonable magnitude by using light-gage brazed or merely closed tubing, or, still better, an armor of galvanized-steel wires; that the permeability and therefore the losses due to the sheath could be still further reduced by laying wires of non-magnetic material alternately with steel wires, and that the loss is not sensibly increased by securing the ends to terminal boxes. The second paper contains a theoretical investigation of the same problem, checked against the experimental results mentioned above, and leads to the conclusion that the use of such cables for extra high-tension transmission is not precluded.—*Journal of I. E. E.* (*England*), April, 1925.

Units, Measurements and Instruments

Development and Characteristics of a 1,000,000-Volt Cascade Transformer at California Institute of Technology.—ROYAL W. SORENSEN.—This paper, which was presented at the Pacific Coast convention of the A. I. E. E. in October, 1924, includes a description and diagrams of the apparatus, as well as a number of performance charts and tables.—*Journal of A. I. E. E.*, April, 1925.

Fire Resistance of Concrete Columns.—W. A. HULL and S. H. INGBERG.—Fire tests have been made on sixty-two columns under working load, and sixteen comparable columns were tested to failure in compression without fire test. The thickness of concrete or other material considered as protection was either 1½ in. or 2½ in. Concrete aggregates of a wide range in mineral composition were introduced. The results of these tests are given in this seventy-page booklet.—*Technologic Paper No. 272 of the Bureau of Standards.*

Connection Checks for Polyphase Watt-Hour Meters.—D. T. CANFIELD.—This bulletin provides an operating manual on the subject of checking the connections of polyphase watt-hour meters. Six different checks are described, each one of which is divided into four parts—special apparatus needed, if any; mechanical or physical operations in the order of their performance, simple and conclusive rules for interpreting the results of the operations in the former, and advantages and disadvantages of each check.—*Bulletin No. 8, Engineering Extension Service, Purdue University.*

Illumination

Effect of Brightness on the Precision of Visually Controlled Operations.—PERCY W. COBB and FRANK K. MOSS.—The test consisted in having the subject set a movable pointed strip opposite a fixed one, by means of a small

hand wheel and rod, the device itself being 10 ft. from the eye and seen in silhouette through an opening in the wall against a more distant flat white background. The brightness of both the field surrounding the test object and the background could be varied. To get the effect of the lighting on precision rather than on speed a fixed time — two seconds — was allowed for each setting. The amount of departure from the correct position was measured with a reading telescope and scale. Four values of brightness were used on the background, and with each of these there were two conditions of field —dark and a brightness equal to that of the background. The mean variation in centimeters in a large number of settings under each of these eight conditions was determined for each of ten observers. The averages for all are given in the following table, condensed from the original:

Surroundings	Brightness, Millilamberts			
	1.00	4.18	20.00	91.50
Dark	0.0745	0.0690	0.0618	0.0625
Light	0.0649	0.0619	0.0584	0.0552

Other relations are given in curves. It is to be expected that the gain in accuracy will reach a practical limit at approximately 20 millilamberts and that at extremely high brightness the effect of glare will enter. In industry, where the output is on a quantity production basis and the operations follow one another at fixed and predetermined intervals, the conditions encountered parallel those of the test, and the gain in accuracy found in the test could be expected in practice.—*Journal of the Franklin Institute*, April, 1925.

Motors and Control

Alternating-Current General-Purpose Motor.—H. WEICHSEL.—This paper is a detailed discussion of the Fynn-Weichsel motor, which has been described in the ELECTRICAL WORLD and in articles to which reference has from time to time been made in the Digest. The theory of its performance is given, with numerous characteristic curves, diagrams, oscillograms and illustrations. An abstract may be found in the ELECTRICAL WORLD report of the midwinter convention of the A. I. E. E., February 21, 1925, on page 393.—*Journal of A. I. E. E.*, April 1925.

Remodeled and Electrified Rod Mill.—S. N. ROBERTS.—This paper describes the changes that were made in modernizing a steam-driven mill. Data are given regarding the motors installed for various purposes, the horsepower, both maximum and average, required for rolling various sizes of rods and bars, and the kilowatt-hour consumption per ton of product. Old and new costs are compared. It is stated that at present the cost per ton for repairs, supplies, etc., of the electric drive is not half of the average cost for same on the old drive, and the power cost is also less than before.—*Iron and Steel Engineer*, April, 1925.

An Electrically Driven Linen Mill.—An account is given of a linen mill in England that has been changed from steam to electric drive. The success of the change is indicated by the fact that during the fourteen months that the new plant has been in operation no breakdown whatever has been experienced and the results have given entire satisfaction. Among the advantages which electrical operation affords may be mentioned increased production as a result of the higher speed of operation and a steadier drive, reducing the number of stoppages necessary to repair broken threads. Better fabric is thus produced, and the employees greatly appreciate the absence of the noise formerly created by heavy gearing and long pulley shafts.—*Electrical Review* (*England*), May 1, 1925.

Electrophysics, Electrochemistry and Batteries

Electrical Conductivity of Cream.—HUGO FRICKE and STERNE MORSE.—The results of the experimental study here reported indicate that the measurement of conductivity furnishes a practical method of determining the butter fat in milk and cream and one as accurate as those now used. The paper is the first of a series in which it is proposed to show the application to different problems of a theory recently developed for the electrical conductivity of a suspension of homogeneous fortuitously distributed polarizable spheroids, conductivities were determined over a frequency range from 1,600 cycles to 200,000 cycles with a Wheatstone bridge, and the volume concentration of the suspended particles as computed by formula was compared with values obtained directly from known dilutions—*Physical Review*, March, 1925.

Measurements of β-Rays Associated with Scattered X-Rays.—ARTHUR H. COMPTON and ALFRED W. SIMON.—Stereoscopic photographs of beta-ray tracks excited by strongly filtered X-rays in moist air have been taken by the Wilson cloud-expansion method. In accord with earlier observations by Wilson and Bothe, two distinct types of tracks are found, a longer and a shorter, which the authors designate as P and R tracks respectively. Using X-rays varying in effective wave length from 0.7 to 0.13 *A*, the ratio of the X-ray energy dissipated by scattering to that absorbed (photo-electrically) was determined. The conclusion is reached that whenever a quantum of X-radiation is scattered an R electron is ejected which possesses a momentum that is the vector difference between that of the incident and that of the scattered X-ray quantum. — *Physical Review*, March, 1925.

Traction

Electric Locomotives for the South African Railways.—A brief description is given, with illustrations and a table of leading data, of combined passenger and freight locomotives designed for operation at 3,000 volts direct current. In view of the narrow gage, 3 ft. 6 in., sharp curves and other limitations, three locomotives are ordinarily coupled together with multiple-unit control. The track has a route length of 171 miles, traversing very hilly country with long and difficult grades. On down grades speed is to be controlled by regenerative braking alone. — *Railway Age*, April 25, 1925.

Telegraphy, Telephony, Radio and Signals

Theory of the Microphone. — R. KELCH.—To establish a theory of the microphone the author has built a special apparatus with which it is possible to measure the delicate variations of the current caused by deflections of the membrane. The latter were produced by weights over a system of fine levers. The writer succeeded in constructing with this apparatus characteristic curves for any type of transmitter, and he points out the great similarity of these pressure-current curves to the typical curves for electron tubes. From these curves can be derived directions for the most suitable design of transmitters and the proper ratio of telephone transformers. For the latter the author gives 1:4 as the most satisfactory value for usual conditions.—*Elektrotechnik und Maschinenbau*, March 29, 1925.

Mutual Inductance of Circuits with Circular Symmetry About a Common Axis. — F. W. GROVER. — Tables are given which do away with the necessity of selecting a formula, and the inductance is obtained by taking the product of the geometric mean of the radii and a factor taken by interpolation from a table. An accuracy of one part in ten thousand in the value of the mutual inductance is obtained.—*Scientific Paper No. 498 of the Bureau of Standards.*

Wireless Wave Propagation.—E. V. APPLETON and M. A. F. BARNETT.—The paper deals with the part played by the atmosphere in affecting the intensity of received signals. The authors refer to experiments showing that for short-wave propagation differences between day and night intensities are observed at distances as short as 50 miles from the transmitter. To test the existence of high-angle reflection from a deviating layer (the so-called Heaviside layer) the signal intensity was measured at a receiving station about 100 miles from a transmitter while the wave length of the latter was varied through a small value. If two rays are received, there should be interference bands. These were found to be produced. The authors proceed to consider the ionic process by which this deviation may be brought about. The analysis, which is in part mathematical, leads to an equation for circularly polarized waves, and a possible explanation for the fading of signals around 350 m. in wave length. A theory for the diurnal variation is advanced.—*Electrician* (*England*), April 3, 1925.

Development of Transmission Circuit in Communication. — J. O. PERRINE. — Attention is directed to the importance of the place occupied by the transmission circuit in the communication art and to the fundamental changes that have been made in the development from a single iron-wire ground-return circuit, carrying a single message, to a copper-wire metallic circuit carrying telephone and telegraph messages simultaneously and which, together with many other metallic circuits, comprises a lead-covered cable.—*Bell System Quarterly*, April, 1925.

News of the Industry

San Francisco Is Ready

Preparations for N. E. L. A. Convention Complete—Reservations Indicate 3,000 or 4,000 Visitors

THE great excellence of the program to be carried out at the San Francisco convention of the National Electric Light Association on June 15-19 and the inspiration that this annual gathering always imparts to electric light and power men in every part of the nation promise a splendid attendance despite the long journey of from one to four or five days that the majority of the delegates will have to take. Indeed, to those not familiar with the great West the opportunity to visit the Pacific Coast has in itself proved an attraction well worth the time and cost. Two weeks from today the advance guard will reach the California metropolis, and a few days later a convention that promises to be historic in the annals of the industry will be in full swing. Already hotel reservations indicate 3,000 or 4,000 visitors.

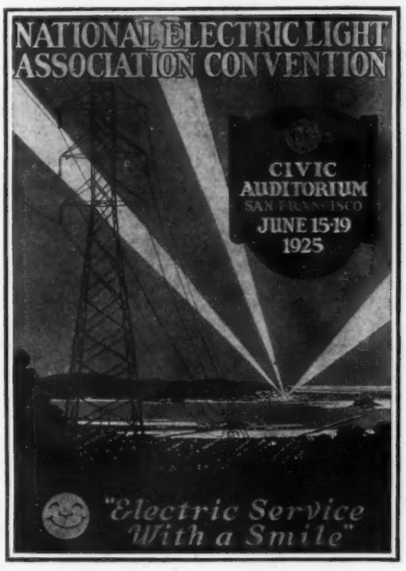
A few changes from and additions to the program as it was printed in the ELECTRICAL WORLD for May 9 (page 993) have been made. One of these is the expansion of the symposium there included to cover a general review of the industry and its financial status as they appear to investment bankers, heads of savings banks and insurance companies and others who control the disposition of large sums. Prominent representatives of such fiduciary institutions will participate.

The convention will open Monday noon, June 15, with a luncheon under the auspices of the San Francisco Electric Development League, at which W. E. Creed, president of the Pacific Gas & Electric Company, will preside. On Monday evening the president's reception and ball will be held at the Fairmont Hotel. Convention sessions will start Tuesday morning at the Civic Auditorium, convention headquarters.

The president's reception at the Fairmont Hotel on Monday evening will take the same form as in other years. Thursday evening will be "Gala Night," and entertainment of an unusual nature will be given. Through the courtesy of the Key System Transit Company an excursion around San Francisco Bay will be provided Friday afternoon on one of the company's electrically operated ferryboats. A trip to Mount Tamalpais has been arranged for Saturday.

FOUR SPECIAL TRAINS

As previously announced in the ELECTRICAL WORLD, four special trains will be provided to take the delegates across the continent from New York and Chicago. Chief among these is the "Red Special," perhaps the finest special train of its size ever made up. The cars and equipment of this train are all new, and a new lighting system has been supplied by the lamp committee of the N. E. L. A. Electrical manufacturers also have contributed lavishly to its furnishings. The "Red Special" will leave the Grand Central Terminal, New York, Sunday, May 31, at 4.05 p.m., daylight-saving time, and stop over at various points of interest in Colorado, New Mexico, Arizona and California, arriving at its destination on the evening of Sunday, June 14. After the convention the train will return over a northern route, stopping at Portland and Canadian points and reaching New York the last of June. A handsome booklet published by the metropolitan Edison companies in Greater New York, illustrating the route and the points at which stop-overs will be made, will be distributed on this train. Another train, to be called the "Blue Special,"



OFFICIAL POSTER OF CONVENTION

a duplicate of the famous "Broadway Limited," will leave the Pennsylvania Station, New York, on Wednesday, June 10, at 3.55 p.m., daylight-saving time, and reach San Francisco at 10.30 a.m. on Sunday, June 14, making no stop-overs.

The "Green Special" will leave the Grand Central Station, Chicago, on June 5 at 9 p.m., Central standard time (10 p.m. daylight-saving time), and embrace an eight-day sight-seeing trip through Canada and Washington and Oregon, reaching San Francisco at 8.10 p.m. Saturday, June 13. An "Orange Special," leaving the new Union Depot, Chicago, June 8, at 9 a.m., Central standard time (10 a.m. daylight-saving time), will make an abridgment of the "Green Special" itinerary and arrive in San Francisco at the same time as the "Green Special." Stop-overs will be made at Seattle, Spokane and Portland.

Power Club Standards

Hot Springs Meeting Makes Progress in Direction of Uniformity and Simplification

SUCCESS even greater than usual characterized the meeting of the Electric Power Club held at Hot Springs, Va., from Monday to Thursday of this week, May 25 to 28. Addresses by prominent executives, divisional and sectional meetings and entertainment features made up the program.

In his official address President A. H. Timmerman outlined the development of the Power Club to meet the needs of the industry and presented in review the present comprehensive scope of its activities. One of the notable features of the work, he said, lies in the standards already established or under way. These have done much to eliminate waste and bring definiteness into the manufacturing industry. Some of the sections are now actively at work on needed standards, and prospects are good for an amplification of this work. The relations of the Power Club with other organizations engaged in making standards were outlined by Mr. Timmerman, and in particular he dwelt upon the desirability of having American standards adopted through the procedure of the American Engineering Standards Committee.

The members discussed the standards situation from the standpoint of procedure and the interrelations of the several organizations engaged in such work and indicated their desire to make the Electric Power Club standards still more complete and useful to the membership, while co-operating heartily in national standards work.

Modern methods for enabling the executive to keep in touch with his business were outlined by C. L. Collens, 2d, in an excellent paper. Simplification in forms, bookkeeping methods and inventory records was shown by means of specific application to a manufacturing plant. The address and the general discussion showed the great saving in time and money that could be made through this type of simplification.

At the evening meetings the divisions and sections made gratifying progress in the development of standards and rules of operation for equipment.

At the annual banquet on Wednesday evening Gilbert H. Montague gave an able address on the Federal Trade Commission. New members elected to the Power Club were the Vulcan Iron Works of Wilkes-Barre and the Pacific Electric Manufacturing Company. Officers were elected as follows: President, Alfred E. Waller, chief engineer Ward Leonard Electric Company, Mount Vernon, N. Y.; vice-president, J. M. Curtin (Westinghouse), re-elected. Secretary Barr and Treasurer Conrad were also re-elected. New members of the board are R. H. Goodwillie, A. H. Timmerman, W. F. Heubley and G. H. Winkler.

Change Conowingo Plans?

In Letter to Commission Philadelphia Rapid Transit Company Says They Have Been Revised

RADICAL changes have been made in both the engineering plans and the cost estimates for developing power at the Conowingo site in Maryland, according to statements made in a letter addressed by the Philadelphia Rapid Transit Company to F. Herbert Snow, chief engineer of the Pennsylvania Public Service Commission. Conferences have been proceeding between the engineers of the commission, of the Philadelphia Electric Company and of the Philadelphia Rapid Transit Company ever since the plans of the Philadelphia Electric, in alliance with the Susquehanna Power Company, to develop Conowingo were halted in April by the opposition of the Philadelphia Rapid Transit Company and the failure of the three commissions concerned—the Pennsylvania, Maryland and Federal Power—to co-operate along lines that would have brought official authorization to the project.

The Philadelphia Rapid Transit, in its letter to the commission, says that the engineering conferences have developed new plans and estimates and asks that the Philadelphia Electric Company be asked to put these before the commission. It says that, because of objections from the owners of the Holtwood (Pa.) hydro-electric plant, the crest elevation of the dam is to be reduced from 103 ft. to 86 ft. with gates above the crest capable of holding the pond elevation at 108½ ft. and wheels with a maximum water use of nearly 7,000 cu.ft. per second instead of 6,000 ft. It says further that 1897 is to be substituted for 1896 as typical of average stream flow, this change reducing the applicant's estimate of the total amount of power that can be produced by given equipment, and also that the Philadelphia Electric Company's representatives have agreed to revise their cost figures for all-steam and for combined steam and hydro operation to accord with a lower full consumption than that on which the figures were first based.

ENGINEERING CONFERENCES END

This letter was laid before the Pennsylvania Public Service Commission, but no action was taken upon it, and it was decided to let the engineering conferences continue. These have come to an end, and a sixty-page report was submitted to the Pennsylvania commission this week. This report has not yet been made public, but it is said to show conclusively that the project would not cost more than the estimate of $52,000,000 on which plans for the development have been made. The report deals, it is believed, with four phases of the project—the stream flow of the Susquehanna in Maryland, the cost of constructing the dam and power house, the amount of power to be available in Philadelphia after all Maryland requirements are filled and the expense and arrangements for the relocation of rail and state property in Maryland.

The Maryland Public Service Commission and the Federal Power Commission will act concurrently with the Pennsylvania commission after the latter's decision, based on the engineers' report, is made public. Rumors that the whole scheme might be abandoned because of the delay interposed are denied.

Insull Predicts Plant Rated at 1,000,000 Kw.

Speaking in Chicago at the formal opening of the first unit of the Commonwealth Edison Company's new Crawford Avenue generating station, President Samuel Insull said on Tuesday of this week that while present plan calls for a plant with an ultimate rating of 750,000 kw., to cost $80,000,000, he looked for it to reach eventually a rating of 1,000,000 kw. and a total cost of $100,000,000. The fourth generating unit in the first section, which has been ordered but not yet installed, will have a capacity of from 70,000 kw. to 75,000 kw. As stated last week, the section at present in operation has one 60,000-kw. unit and two 50,000-kw. units.

Citizens and Company Disagree on Hetch Hetchy

Failure of the citizens' advisory committee and officials of the Pacific Gas & Electric Company to reach an agreement has thrown the entire matter of the temporary disposal of San Francisco's Hetch Hetchy power open again after it was thought the matter was nearing settlement. The Pacific Gas & Electric Company offered the city $2,000,000 a year for the 420,000,000 kw.-hr. of energy from the Moccasin power plant, to be paid in equal monthly installments. The advisory committee proposed a plan by which the power might be distributed over the private corporation's lines to consumers, to be charged for at existing legal rates, all bills to be collected and accounted for by the power company for a stipulated compensation or a fixed price per unit of power handled, said compensation to be determined by the State Railroad Commission.

Awards for Men of Electrical Industry

James H. McGraw Offers Four Medals and Cash Prizes to Promote Sound Thinking for Its Advancement—Three Go to Manufacturers, Jobbers and Contractors, Fourth for Co-operation

TO "ENCOURAGE individual initiative and creative thinking among electrical men," James H. McGraw, president McGraw-Hill Company, Inc., has established four annual awards, three to be competed for by men of the manufacturing, jobbing and contractor-dealer branches of the electrical industry respectively, and the fourth to be open, in addition, to men of the central-station industry.

The awards will be presented in the first three instances to that man in each field who is judged to have made the most important personal contribution to improvement or progress in the advancement of the processes, the practices or the policies of manufacturing, jobbing, contracting or merchandising. the fourth award will be given to that electrical man in any of the four branches of the industry who has contributed the most valuable and useful idea for promoting co-operation between any two or more branches of the electrical industry.

No separate award is made to men of the central-station industry exclusively, in view of the fact that this field is already covered by the James H. McGraw prize and other annual awards presented each year at the National Electric Light Association convention.

Each award will take the form of a bronze medal and a purse of $100. The Society for Electrical Development will act as sponsor for these awards and has appointed a committee of awards which will prepare an appropriate medal and conduct the contests.

The manufacturers' medal and purse will be awarded at a meeting of either the Associated Manufacturers of Electrical Supplies or the Electric Power Club, the jobbers' medal and purse will be similarly awarded at the meeting of the Electrical Supply Jobbers' Association, the contractor-dealers' medal and purse at the meeting of the Association of Electragists International, and the medal for co-operation and purse at a special dinner meeting of representatives of all branches of the electrical industry to be arranged by the directors of the Society for Electrical Development.

The awards have three objectives:

1. To give public recognition and reward for ideas which have been contributed to the common good by individuals of the electrical industry.

2. To give publicity to these ideas that they may have wider application and employment.

3. To stimulate and encourage electrical men to think constructively for the broad improvement of the electrical industry and to carry through the ideas that occur to them.

Any employee of any house that is recognized by the judges as belonging to the branch or branches of the electrical industry competing for the award will be eligible for this award. Entries will be judged by juries of five, four in each case to be appointed by an association concerned and one by Mr. McGraw. The first competition for these awards will close on September 1, 1925. Fuller information can be had by addressing the James H. McGraw Awards, in care of the Society for Electrical Development, 522 Fifth Avenue, New York.

The committee of awards appointed by the Society for Electrical Development consists of W. W. Freeman, president Union Gas & Electric Company, Cincinnati; H. B. Crouse, president Crouse-Hinds Company, Syracuse, N. Y.; W. E. Robertson, vice-president Robertson Cataract Electric Company, Buffalo; L. K. Comstock, president L. K. Comstock & Company, New York; F. M. Feiker, vice-president Society for Electrical Development, and Earl E. Whitehorne, commercial editor ELECTRICAL WORLD.

Five Steam-Power Papers

A. S. M. E. Talks About Intake Equipment, Pipe Covering, Turbines and Plant Performance

AT THE steam-power session of the spring meeting of the American Society of Mechanical Engineers in Milwaukee on May 21, other sessions of which were noted last week, five papers were presented dealing with the securing of cooler condensing water by proper intake arrrangement, a rational design of pipe covering for temperatures up to 800 deg. F., steam-turbine development, analysis of power-plant performance, and comparison of actual performance with theoretical possibilities at Lakeside.

Discussion of the paper on "Lake Waters for Condensers," by Prof. A. G. Christie, brought out the necessity of low-entrance velocity at intakes to avoid a vortex which will draw in hot surface water even with deep intakes. Attention was also called to the spring and fall turnover of water that disturbs the otherwise cold and warm stratification of northern lakes. Colonel C. G. Spencer of McClellan & Junkersfeld said the economy from cooler condensing water is very attractive as it not only increases the economy of the plant but reduces the amount of condenser and auxiliary equipment needed if there is a large difference between summer and winter water temperatures. In closing the discussion Professor Christie called for improved hydraulic design to reduce pumping head and avoid drawing in surface water.

The paper on "Rational Design of Pipe Covering," by W. A. Carter and E. T. Cope of the Detroit Edison Company, analyzed the problem of determining the most economical thickness of covering as based on the work of Heilman, Eberle and others, considering single and compound coverings. Results of tests by the Commonwealth Edison Company to determine the change in conductivity of different pipe coverings with use were briefly related. Mr. Cope said that the difference in the total cost between applying 3½-in. and 4-in. covering is not appreciable. Research to determine the absolute thermal conductivity of materials was urged.

In reviewing steam-turbine development, Hans Dahlstrand, Allis Chalmers Manufacturing Company, related the effects which use of higher-pressure and higher-temperature steam has had upon turbine efficiencies and materials used in construction. Doubt was expressed by Professor Christie regarding the economy of changing low-pressure plants to high-pressure ones, it being suggested that old plants be retained for standby service and new ideas embodied in extensions to old plants or in new ones. Reference was also made to the success of German engineers in draining moisture which condenses in turbines, and the question was raised whether the stages where moisture develops could not be bled for feed-water heating to advantage.

The thermal gains from high-pressure boilers can be accurately calculated, declared J. F. Johnson, Westinghouse Electric & Manufacturing Company, but their economies are more difficult of determination. He referred to the rapid displacing of units that are modern in date but have been made obsolete through further development, to the increasing pressure and temperature of existing equipment, the use of regenerative turbines, steam extraction and improvements in furnaces as being some of the things which have contributed to increased economy. In laying out the Weymouth station, E. W. Norris of Stone & Webster explained, the equipment was selected and arranged so that either the ultra-high-pressure or normal-pressure apparatus can eventually carry the peak or base loads, it being unproved up to this time to which type of load the ultra-high-pressure is best adapted. Regarding high-pressure turbines with high back pressure, Alfred Iddles of Day & Zimmermann pointed out that the opportunities for its application are increasing, because higher process pressures are being utilized every day to good advantage in industry. One case was cited where a 600-lb. turbine operates at 150-lb. back pressure.

A step-by-step method of analyzing power-plant performance that shows the losses of available energy occurring in each stage of the process was presented by Prof. W. L. DeBauffre. M. K. Drewry, Milwaukee Electric Railway & Light Company, presented a paper showing the degree of perfection attained at Lakeside, pointing out the magnitude of various losses occurring in actual practice.

OFFICERS NOMINATED

Nominations for officers of the society for 1926 as presented by the nominating committee are: President, William L. Abbott, chief operating engineer Commonwealth Edison Company, Chicago; vice-presidents, Prof. Alex. G. Christie of Johns Hopkins, Prof. William T. Magruder of Ohio State University and Roy V. Wright, managing editor *Railway Age;* managers, Prof. Robert L. Daugherty of the California Institute of Technology, William Elmer of Altoona, Pa., and Charles E. Gorton of New York, N. Y.; treasurer, Erik Oberg, editor *Machinery*, New York.

Election will be by ballot of the entire membership, closing on September 22, 1925.

Middle West Convention Concludes

Public Relations and Commercial Opportunities Are Prominent in Program of Second and Third Days—Chairman of State Commission Points to Potential Dangers

THE third annual convention of the Middle West Geographic Division of the National Electric Light Association closed in Omaha on Friday, May 22, after carrying out a program of unusual interest in which several men of national importance in the industry took part. An account of the first day's proceedings, including discussions of farm electrification, public relations and the work of women's organizations, was printed last week (page 1091). In his address of welcome to the convention J. E. Davidson, vice-president and general manager Nebraska Power Company and vice-president of the N. E. L. A., spoke of the growing interest of the farmer in the possibilities of electric service and remarked that there were still senators at Washington who were trying to mislead the people of the Middle West.

Improved methods of utility bookkeeping were discussed by P. F. Gow, Kansas Gas & Electric Company, Wichita. A paper by C. A. Sears, Mississippi River Power Company, Keokuk, Iowa, dealt with the results achieved through safety work. F. Le Roy Blanchard of Henry L. Doherty & Company, New York, illustrated the danger of advertising when a company is in no position to give good service, the danger of withdrawing from advertising when business is poor and the danger of following the belief that any one can write advertising. "No utility is so small that it cannot profit from well-directed advertising," said Leo Bozell of Bozell & Jacobs, Omaha. The importance of tying up good-will advertising with the growth of the community was emphasized by this speaker.

The public relations problem was treated from the standpoint of the executive by Earle M. Hodges, Arkansas Utilities Information Bureau. Public relations as a responsibility of commercial men were the subject of a paper by Worth Bates, Missouri Gas & Electric Service Company, Lexington, Mo. M. H. Aylesworth, managing director N. E. L. A., reminded the convention that while certain Middle West senators were talking of bringing Muscle Shoals to Nebraska there had been built in Chicago a power plant larger than Muscle Shoals, that while certain political leaders were talking of government exploitation of "giant power" and while the government was, after eight years, completing construction of 100,000 hp., the electric light and power industry had completed the construction of more than 10,000,000 hp.

"The goal of a regulatory body is to interfere as little as possible with the business of running a utility," said Thorne A. Browne, chairman Nebraska Railway Commission. Potential dangers in the present utility situation as seen by Mr. Browne are: (1) The selling of utility stock to customers by promoters who have no intention of remaining in business; (2) the operation of subsidiary construction companies at charges to the operating company greater than charges by contractors under free competition; (3) the keeping of inaccurate and misleading books of account for purposes of promotion and finance; (4) the selling of securities to customers on the basis of expected earnings, without a strong buffer of common stock.

Commercial opportunities and responsibilities received consideration in the third day's program, under the direction of C. D. SeCheverell, vice-president Central Power Company, Grand Island, Neb. In opening the commercial meeting, Mr. SeCheverell

said: "The true value of a utility's service is measured by the degree of satisfaction and efficiency attained by the customer in the utilization of the service."

W. R. Putnam, general manager Idaho Power Company and chairman National Commercial Section, spoke on "Commercial Responsibilities." Keeping the unit cost of service down although the cost of construction and furnishing service has increased is to be accomplished, Mr. Putnam said, by placing in the homes of the country the proper number and kind of appliances. Profitable lines of activity are (1) selling electric ranges to a fair percentage of those electric customers who are not served with gas, (2) developing domestic electric refrigeration, (3) active support of street lighting, commercial lighting and industrial lighting, and (4) an endeavor to build up among the industries of the country a consumption of energy double the present rate, a development that will be even more profitable to industry than to the power companies. To do all this will require the increasing of commercial activities by 300 per cent.

DOMESTIC REFRIGERATION HERE

"Domestic Electric Refrigeration Has Arrived" was the subject of a paper by B. J. George, Kansas City Power & Light Company. The remarkable growth of the domestic electric refrigeration business was related, the Kansas City utility having sold more machines during the first four months of this year than during all of last year. The value of the load in Kansas City has been established as $2.15 per month per machine, with an annual revenue of $100 per kilowatt of demand. The problem of the commercial ice man in meeting the competition of the electric machine is, in the opinion of Mr. George, to meet the machine on its merits and to sell and service the machines themselves. In this way the ice companies will be able to retain customers in the majority of homes and will not have to be content with only the small, intermittent, short-season user of ice.

Appearing for T. L. Phillips, Union Gas & Electric Company, Cincinnati, C. A. Nash, United Light & Power Company, Davenport, Iowa, discussed the work of the appliance committee of the national association in surveys and studies at Cincinnati. These studies showed that 86 per cent of a group of five thousand customers had less than two appliances and that the minimum-bill customers had only one appliance. By introducing appliances into the homes of these minimum-bill customers the gross revenue was built up to $25 per year per customer.

The duties and opportunities of the power salesman were discussed by C. E. Murphy, Sioux City (Iowa) Gas & Electric Company, who made a plea for more complete data on operating experience of oil engines as an aid in meeting what was called the unfair practices of some representatives of engine manufacturers.

The convention adopted a resolution urging the support of farm engineering work in the summer months by the students of agriculture, who will lead the movement to electrify the farm.

Representative Charles A. Eaton of New Jersey spoke at the annual banquet of the convention, taking as his keynote: "Keep the government as umpire—let individuals play the game."

Officers elected are: President, S. B. Irelan, vice-president and general manager St. Joseph (Mo.) Railway, Light, Heat & Power Company; first vice-president, Frank H. Brooks, vice-president and general manager Nebraska Gas & Electric Company, Lincoln; second vice-president, R. T. Smalley, manager Kansas Electric Power Company, Emporia; third vice-president, E. F. Buhlman, vice-president and general manager Iowa Southern Utilities Company, Centerville; secretary-treasurer, Horace M. Davis, Lincoln.

Nebraska Section Elects J. B. Hill as President

At its annual meeting held in Omaha last week the Nebraska Section of the National Electric Light Association elected J. B. Hill of Lincoln as its president. Mr. Hill is vice-president and general manager of the Lincoln Gas & Electric Light Company. C. D. SeCheverell, vice-president Central Power Company, Grand Island, was elected vice-president, and Horace M. Davis of Lincoln was re-elected secretary. The election of officers occurred at a special meeting of the Nebraska Section held in connection with the Middle-West Geographic Section convention.

Canada's New Holding and Management Company

An outline of the plans of the Power Corporation of Canada, Ltd., recently incorporated with an authorized capital of $10,000,000 and power to extend its activities from the Atlantic to the Pacific, has been issued by Nesbitt, Thomson & Company, investment security bankers. The main idea is to centralize the financial control of a number of existing power companies in Quebec, Ontario, Manitoba and British Columbia and also to provide a general staff of engineering supervision, with a view to economy. This is a new departure in the Canadian power field.

The corporation will issue $10,000,000 preferred stock and 250,000 shares of no-par-value common stock, and will acquire controlling interest in a group of companies, which will include the Ottawa & Hull Power Company (which controls the Ottawa River Power Company), Canada Northern Power Corporation, Ottawa-Montreal Power Company, Ltd., and East Kootenay Power Company, Ltd., and will also own a substantial interest in Southern Canada Power Company, Ltd.; Winnipeg Electric Company, Manitoba Power Company and other corporations.

The companies of which Nesbitt, Thomson & Company are either in control or for which they are fiscal agents are in Quebec, Ontario, Manitoba and British Columbia and have an installed capacity of more than 325,000 hp. and an ultimate capacity of more than 600,000 hp. These companies have an outstanding capitalization of more than $100,000,000 and supply directly and indirectly cities and towns with a population of nearly a million.

Diamond Creek Delay

No License Before September for Colorado River Development—Other Projects Before Commission

EXECUTION of the license covering the proposed development on the Colorado River at Diamond Creek, which has been hanging fire during the long controversy over the seven-state treaty and the Boulder Canyon dam, has been suspended further by the Federal Power Commission. At its meeting on May 23 the commission decided to take final action on that project in September. In the meantime those interested are to have an opportunity to present any new considerations which may have developed. It was indicated clearly, however, that the license would be issued unless reasons not now of record are brought forth. In this connection the commission will hold a public hearing at a time and place to be announced hereafter.

At this meeting the commission authorized the issuance of a license to the Hydraulic Race Company and the Lockport-Newsane Mill Owners' Association for the diversion of 275 sec.-ft. daily from the Niagara River and its transportation through the New York State Barge Canal under the existing agreement with the state authorities. The water is to be used in the power plants of the applicants along Eighteen-Mile Creek.

The Kentucky-Tennessee Light & Power Company has applied to the commission for a preliminary permit covering a project on Green River, in Henderson County, Ky., 9 miles northeast of Henderson. It is desired to erect a power plant on the east bank of the stream immediately below United States Dam No. 1 and to install equipment sufficient to generate 6,000 hp.

The Lake Virginia Mining Company has applied for a preliminary permit covering a project on Mill Creek, at the outlet of Lake Virginia, near Wrangell, Alaska. It is proposed to construct the dam at the outlet of the lake and build a 1,200-ft. flume to a power house on Eastern Passage. About 1,000 hp. of primary power thus can be developed, it is estimated.

The commission has amended the license of the Houston Power Company of Newton, Ala., so as to extend the period of construction from October 1, 1925, to October 1, 1927. An extension of two years in the time for beginning and completing construction work has been granted the Excelsior Water & Power Company of Smartville, Cal., the beginning of construction work having been delayed awaiting the granting of water rights by the Railroad Commission of California.

Oklahoma Launches Program of Farm Electrification

A conference was held in Oklahoma City last week at which the first steps were taken to institute a program of rural electrification in Oklahoma. Twenty-five persons were present, representing farmers, utility companies, manufacturers, the Agricultural and Mechanical College, the Oklahoma *Farmer-Stockman*, the National Electric Light Association and the Okla-

homa Utilities Association. Dr. E. A. White, chairman of the National Committee on the Relation of Electricity to Agriculture, was present and told what has been done in other states. The meeting authorized the manager of the Oklahoma Utilities Association, as temporary chairman, to create a committee made up of official representatives of farmers' organizations, utility companies and the A. & M. College to determine the best methods for carrying out the purposes of the conference.

The problem in Oklahoma is regarded as more complicated than in most states where substantial progress in rural electrification has been made, because of the widely scattered population and because more than 50 per cent of Oklahoma farms are occupied by tenant-farmers. A meeting of the proposed official committee will be held at an early date, and it is expected that a representative will be designated to attend a conference at Madison, Wis., June 26-27, at which representatives of rural electrification projects in fifteen states will be present.

Further Debate at Ottawa Over Carillon Power Project

Following the tabling on May 18 of the unsigned draft contract for development and export of power at Carillon, on the Ottawa River (see ELECTRICAL WORLD for May 23, page 1095), the Canadian House of Commons spent the whole of the following day discussing the question pro and con. At times the debate waxed exceedingly warm. Sir Henry Drayton, former Minister of Finance, led the attack, charging that H. B. McGivern, minister without portfolio in the present government, and Senator Haydon, one of its supporters, were behind the power company.

George P. Graham, Minister of Railways, argued that if the Dominion government declared against such export, then all contracts between power-exporting companies and American firms would be affected and all the companies which exported would have to increase their prices to Canadian consumers.

T. A. Crerar, former leader of the Progressive party, was opposed to the development of power by private concerns and did not favor the bringing in of extensive American capital.

Premier King said the government had already stayed its hand for many months in this matter and did not intend proceeding with any haste whatever. The government, he said, would do nothing about the proposed contract for another year until Parliament could meet again and pass such legislation as would absolutely safeguard the interests of Canada in the matter of export of power.

After some further discussion, Sir Henry Drayton returned to the attack. He found absurd the suggestion that development of power at Carillon under the proposed contract would build up Canadian industry. A handful of men could run a very large power plant, and the real industry which would give big employment would be operated in the United States with Canadian power. He opposed the principle of exporting power. Even under the yearly license system, he said, there was a tendency through transportation of power to take away its control from Canada.

Illuminating Niagara

Twenty-four Searchlamps with Color Screens Transform Falls in Night-Time Hours

PERMANENT illumination of Niagara Falls has been made possible through the installation of twenty-four 36-in. scintillators, rated in all at 1,300,000,000 cp., on top of an old spillway in Victoria Park on the Canadian side, midway between the Horseshoe and the American Falls. When night settled down on May 24, which is a Canadian holiday, the lights were turned on. The initial beams were of white light, but as the display progressed color screens were brought into service. There were red, orange, green, blue and violet of the spectrum colors and deep red and magenta of the special colors, while the soft colors were pale blue, orange and rose. A change of screens made the falls look like a torrent of blood. Another change gave an orange hue to the falling waters, which turned to green with another shifting of screens.

A blending of colors represented the aurora borealis, and on June 8, when the climax of effect is expected to be reached, it is promised that Niagara will be shown under light corresponding to that during the recent total eclipse. There will be celebrations on both sides of the river at that time.

The searchlamps were built by the General Electric Company at its Schenectady works. Their construction embodies several new features which, it is stated will result in greater illumination and easier operation. Instead of depending on natural ventilation these new searchlamps have each an electrically operated suction ventilator mounted upon the top which removes any smoke or gases that would otherwise tend to diminish the amount of illumination produced. The carbons used in the lamps are smaller and of high intensity, giving greater density to the illumination. At the same time the rate of flow of the electricity utilized has been increased from 110 amp. to 125 amp. W. D'Arcy Ryan, illuminating engineer for the General Electric Company, is in charge of the installation and display.

Pacific Gas & Electric Charged with Discrimination

The Pacific Gas & Electric Company has been charged before the California Railroad Commission with attempting to increase by $1,000,000 annually the cost of power supplied to consumers by municipally owned systems in central and northern California and to strike a blow at municipal ownership of electric systems. The charges came out before Commissioner Clyde L. Seavey following submission by the Pacific Gas & Electric Company of a petition for permission to increase the rates in its Schedule P-6. This schedule sets the rates that may be charged purchasers of power for resale, which includes about forty municipalities from Hollister in the south to Redding in the north.

James F. Pollard, vice-president and general manager of the Coast Valleys Gas & Electric Company, which buys its power, told Commissioner Seavey that instead of losing $400,000 annually under Schedule P-6, as it claims, the Pacific Gas & Electric Company is earning 8.3 per cent on its investment and presented figures purporting to prove his statement.

G. H. Moore, district attorney of San Benito County, who attended the hearing in the interests of power consumers in that county, then declared: "The Pacific Gas & Electric Company has said that if it can be allowed to raise the rates under Schedule P-6, it will cut other schedules to leave its gross revenue as it is. This is significant. It merely wants to make power cost more to consumers who buy through municipally owned and operated plants. It is a blow at municipal ownership." Mr. Moore stated that under the proposed rates the price of power in San Benito County would be increased approximately 22 per cent.

From questions asked by Attorney Frank Devlin, formerly a member of the Railroad Commission, who appeared at the hearing for the Vallejo Electric Light & Power Company, it is thought that the opponents of the Pacific Gas & Electric Company's petition will ask for a general rate hearing.

Work on Muscle Shoals Plant Nearly Completed

Construction work at Muscle Shoals has reached the cleaning-up stage. The masonry work of the dam, the lock and the power house have been completed, with the exception of a small amount of work around the Newport News waterwheels and the switch house. The main spillway gates have been installed and the machinery for their operation is practically ready. The work still to do is in connection with the installation of the lock gates, the switchboard and the switching apparatus. The latter two pieces of work are under contract so that the organization of the corps of engineers is being demobilized rapidly.

Stanislaus River Co-operative Plan Approved by Voters

The proposed bond issue to construct a reservoir on the Stanislaus River at Melones for irrigation and power purposes at an estimated cost of $2,200,000 and under a co-operative agreement with the Pacific Gas & Electric Company was carried in both the Oakdale and the South San Joaquin Irrigation Districts on May 18 by heavy votes. In the Oakdale district the vote was 988 for the issue and 36 against it; in the South San Joaquin district 1,452 voted for the issue and 357 voted against it. The power plant, to be constructed by the Pacific Gas & Electric Company and to be operated by water purchased from the two irrigation districts, will cost more than $2,000,000, and the agreement, it is said, will give the South San Joaquin and the Oakdale districts the cheapest irrigation in the state.

Paper Mills and Power

Trend in New York State Is to Segregate Hydro-Electric Generation from Paper Manufacture

THE International Hydro-Electric Corporation has been incorporated by the International Paper Company in New York State as a subsidiary to be controlled by stock ownership. Its formation represents the segregation of the International Paper Company's water-power properties from the manufacturing end of the business. It will take over the water-power rights in connection with the production of electricity, and it is formed so that financing may be done from time to time as a power company rather than a paper-manufacturing company. The new corporation, while a power corporation, is not, however, a public utility.

In this connection it may be noted that the purchase of the Riordon-Gatineau properties in Quebec is reported not only to have insured the International Paper Company an adequate supply of pulpwood for many years to come but to have furnished it as well with many valuable water-power sites. As a producer of hydro-electric power the International Paper Company may soon rank with important public utility companies. Its developed water powers have a present installed capacity of 180,000 hp., said to be capable of being increased through further development and through the utilization of undeveloped sites to more than 600,000 hp. Thus the company, with its wholly owned subsidiaries, is among the largest holders of developed and undeveloped water powers on the continent.

Included in the Gatineau purchase is a valuable water-power site on the river of that name. Above Ottawa, and within easy transmission distance of that city, is a natural waterfall of 140 ft. capable of development at low cost to produce 70,000 hp. This, it is said, is more than enough to meet the requirements of the largest newsprint mill. The new acquisition, especially if the Grand Falls project in New Brunswick also becomes a source of energy production for the company, will permit it to follow the logical trend in the paper industry by doing its newsprint manufacturing in Canada and to devote its American mills to the production of fine paper, selling their surplus hydro-electric energy to public utility companies, as is already done in the case of the company's Sherman Island development on the Hudson River.

POWER FROM OTHER PAPER MILLS

The step may be said to represent a trend among paper manufacturers in the segregation of their power properties and water rights. The pioneer in this movement was the St. Regis Paper Company, which owns a controlling interest in the Power Corporation of New York as the result of the transfer of all its water-power sites and hydro-electric developments in 1922. The St. Regis Paper Company is also said to own about 85 per cent of the common stock of the Northern New York Utilities, Inc. Plans are said to be under way for consolidating the Hanna Paper Corporation, already controlled by the same interests as St. Regis, with the St. Regis company.

The Union Bag & Paper Company, which owns a hydro-electric plant at Hudson Falls, N. Y., expects when the regulation of the Hudson River is completed to find 45,000 hp. to 50,000 hp. aded to its potential output. This would give the paper company a large surplus of electrical energy which it would probably wish to dispose of to central-station interests in its territory.

Co-operation Urged by Georgia Electrical Association

The Georgia Electrical Association held its semi-annual meeting at the Henry Grady Hotel, Atlanta, on May 21 and 22. The registration was approximately 150 and was representative of virtually all electrical interests in the state. The principal speaker of the Thursday morning session was L. W. Davis, general manager of the International Association of Electragists, on the subject of "Contractor-Dealer Accounting." Mr. Davis stressed the importance of the contractor-dealer using improved methods of accounting and cost finding. His talk was so well received that later in the day approximately sixty contractor-dealers attending the convention met in special session to hear more from Mr. Davis, and indications are that the accounting system of the Electragists will be adopted by a number of the firms represented.

In line with the idea of helping the contractor-dealer, the next speaker was H. S. Cohen, vice-president of the Citizens' and Southern Bank, Atlanta. Mr. Cohen outlined the many advantages that accrue to the contractor by the installation of a good accounting system and especially its application in the banking field and dwelt on the importance of the contractor-dealer presenting the bank with a clear-cut statement of his business when he applies for loans or general assistance.

F. A. Wilson-Lawrenson, publisher of the *Atlanta-Georgian*, spoke next on the subject of "Courtesy Discounts." The program committee asked Mr. Lawrenson to give this talk to tie in with the action that is now being taken by the Georgia Manufacturers' Association to do away with the evil of promiscuous courtesy discounts throughout all industries. Mr. Lawrenson's talk was based on the misuse of discounts as applied to the electrical industry, and he asserted that this evil could not be corrected unless concerted action was taken by the manufacturers and jobbers and all allied lines.

The Friday morning session was opened by G. E. Jacquet of the Society for Electrical Development, who gave a comprehensive exposition of the "Red Seal" plan launched by the society. While the Georgia Electrical Association could not take over the plan itself, the object of the talk was to interest the presidents of the local electrical leagues in the towns of the state, and indications at present are that the leagues in Atlanta, Augusta, Athens, Columbus, Macon and Savannah will adopt the "Red Seal" plan.

W. T. Anderson, publisher of the Macon *Daily Telegraph*, outlined briefly the resources and possibilities of Georgia and spoke interestingly of the part that the electrical interests could and would play in its development.

The meeting closed Friday night with a banquet, the principal speaker being P. C. Gilham, president of the Gilham-Schoen Electric Company, Atlanta. Mr. Gilham spoke on co-operation between the jobber and the contractor-dealer, saying that a better feeling between these two electrical lines had been stimulated in past years through the association meetings but that there was still much to be done. One point emphasized was the necessity of eliminating direct sales to consumers by the jobbers.

The following officers were elected for the coming year: President, G. K. Hutchins, Columbus Electric & Power Company; vice-president, H. A. Pendergraph, Athens Railway & Electric Company; secretary and treasurer, W. W. Barr, Georgia Railway & Power Company.

Hydro-Electricity and Newsprint Industry in Canada

In its report on the water-power resources of Canada the Dominion Water Power and Reclamation Service of the Department of the Interior makes the following reference to the growing use of water power in the pulp and paper industry:

"Perhaps the most conspicuous feature of recent industrial progress in Canada has been the growth of the pulp and paper industry, due to the fortunate occurrence of tremendous supplies of growing pulp wood in close proximity to readily developable water powers of a size to provide the large amounts of power essential to the conversion of raw material into the finished product. The importance of ample supplies of low-priced power lies in the fact that it takes practically 100 hp. for each ton of daily output of newsprint.

"A recent development of interest affecting the power consumption of this industry is the rapid adoption of electric-steam boilers as a means of transforming any surplus of available electric energy into steam for pulp cooking, drying, heating, etc. Generally speaking, steam cannot be produced by electricity as ordinarily sold on the kilowatt-hour basis in direct competition with coal, except where surplus power can be contracted for at a low rate, but large consumers of electrical energy commonly buy blocks of power on a flat contract over an extended time to cover their normal or future requirements, and on Sundays, or when business conditions demand a reduced scale of operation, the surplus can be profitably converted into steam. Similarly those mills which maintain their own hydro-electric equipment are provided with an advantageous use for any surplus power which they may be able to generate from the water at their disposal.

"There are 122 pulp and paper mills operating in Canada by hydraulic or hydro-electric power, utilizing a total of 731,794 hp. This is made up of 503,039 hp. installed by the mills themselves

and 228,775 hp. purchased from hydro-electric central stations. The rapid development of the electric drive in this industry is indicated by the fact that 215,472 hp. of the installation in the mills is connected to generators, which added to the 228,755 hp. purchased power gives a total electric drive of 444,227 hp., or over 60 per cent of the power used."

Briefer News

Carthage Plant Bought by Tennessee Electric Power Company.—The Smith County Electric Company of Carthage, Tenn., has been bought by the Tennessee Electric Power Company for $120,000, including extensions to Hartsville, Lafayette and other villages. It is said that this purchase marks the beginning of a power development on the upper Cumberland.

Ontario Hydro May Lose Large Customer.—It is reported that a smelter at Deloro, Ontario, which is now working twenty-four hours a day, is planning to build a dam on Crowe River to develop its own electrical energy. The plant is now one of the Ontario Hydro's best customers, requiring a vast amount of power to keep its machinery in operation night and day.

Holyoke (Mass.) Municipal Plant Cuts Rates 16 and 10 per Cent.—The Holyoke (Mass.) Gas and Electric Department has established a net price of electricity for lighting at 5 cents per kilowatt-hour, a reduction of 16 per cent, effective June 1. It is estimated that this will save consumers $70,000 on domestic and commercial lighting. At the same time an average reduction of 10 per cent in the price of electricity used for power will become effective, with an estimated saving to consumers amounting to $25,000 a year.

Ninety Thousand Acres Classed as Power Site Land.—During the month of April 90,000 acres of public land in Colorado and Utah were classified as areas valuable for power-site purposes, according to information made public at the Interior Department. The classification was made by the Geological Survey. The area of outstanding withdrawals of power-site lands was increased about 2,000 acres in California and decreased about 3,000 acres in Colorado and Idaho.

Lewis River, Wash., May Be Site of 50,000-Hp. Plant. — Application for water-power rights on the Lewis River, Wash., has been filed with the State Department of Hydraulics at Olympia by H. L. Gilbert of Portland, Ore., who asks appropriation of 2,000 sec.-ft. of water for the development of a hydro-electric power plant of 50,000 hp. The work is estimated to cost $3,000,000.

American Power & Light Gets Bend (Ore.) Company. — Ownership of the Bend (Ore.) Water, Light & Power Company has passed formally to the American Power & Light Company, New York, according to an announcement made by Guy W. Talbot, president of the Pacific Power & Light Company and the Northwestern Electric Company, other American Power & Light Company properties. Mr. Talbot becomes president also of the Bend company, John A. Laing vice-president, T. H. Foley vice-president and manager and C. W. Platt secretary and treasurer. The Bend property consists of a 1,310-kw. hydro-electric plant on the Deschutes River and the necessary distribution lines.

Important Departments of Interstate Power Company to Be Centered at Dubuque.—The Interstate Power Company has designated Dubuque, Iowa, for headquarters of the general auditing department of the Interstate company and the construction department of the Utilities Power & Light Company. The centralization of these departments in Dubuque will begin June 1. The auditing departments now in Chicago, Albert Lea and other points will be transferred to Dubuque and the construction department will be moved from Chicago.

This Time It Was a Snake.—Frank Koontz, superintendent of transmission for the Oklahoma Gas & Electric Company, reports an unusual service interruption on the company's 63,000-volt transmission line, probably the first instance of its kind on record. On April

7, a warm day with little wind, the line between El Reno and Enid "kicked out," but immediately came back. A line patrol sent out to investigate could find no cause for the interruption. Mr. Koontz then made an inspection himself and discovered that a bull snake, 6 ft. long, had climbed a 45-ft. pole, crawled out on the cross-arm, wrapped himself about it three times with his tail hanging down and had "shorted out" a string of three insulators. The snake was dead, but the services of a line crew were needed to remove it.

Holstein (Iowa) Company Changes Hands.—The Holstein (Iowa) Service Company has been sold to the Iowa, Light, Heat & Power Company, which purchased 300 of 500 outstanding shares of the company at $310 a share. The Cedar Rapids Light & Railway Company holds the other 200 shares.

Block Island to Have Central-Station Service. — By the formation of the Island Light & Power Company at New Shoreham, R. I., plans are being rapidly consummated to furnish electric service to the well-known resort of Block Island during the coming summer. The company has obtained a charter from the Rhode Island Legislature and is now installing a plant. The authorized capital stock is $50,000, half of which is to be issued at present. William E. Sherwood of Providence is to manage the company.

Home-Lighting Primers Free. — The Lighting Educational Committee has decided to distribute to the industry, free of charge, its surplus stock of the home-lighting primers that were used in the national essay contest for school children. Orders for any quantity will be honored as long as the stock lasts. The committee's address is 680 Fifth Avenue, New York City.

Louisville's New 27,000-Kw. Turbine Begins Service.—Last week the Louisville Gas & Electric Company placed in regular operation the new 27,000-kw. steam-electric turbine unit in its Waterside plant, bringing the installed capacity of the plant up to a total of 94,000 kw. City officials and representatives of various civic organizations participated in inauguration ceremonies. The Waterside plant is the largest in Kentucky. Plans adopted provide for supplementing it by means of hydro-electric plants at the Falls of the Ohio and at Green River, near Mammoth Cave.

New Jersey Public Service to Carry Its Newark-Jersey City Lines Over Two Rivers and Two Railroads.—Crossing both the Passaic and Hackensack Rivers, the Kearny yards of the Pennsylvania Railroad and the main line of the Lackawanna Railroad, a series of eighteen steel towers, some more than 200 ft. high, are being constructed by the Public Service Company of New Jersey in preparation for the power line which will interconnect its three big generating plants in Newark, Kearny and Jersey City when the Kearny station is completed. The line will be known as the Essex-Kearny-Marion tie line.

Senator Norris to Study Ontario Hydro-Electric System.—Upon the invitation of the Ontario Hydro-Electric Power Commission, Senator Norris, chairman of the United States Senate committee on agriculture, who has played a prominent part in the Muscle Shoals agitation, is about to visit Ontario with a view to studying the province's hydro-electric system and applying his information to the Muscle Shoals project and the general question of power in the United States. "Senator Norris has been invited by Sir Adam Beck," said Engineer Gaby of the Hydro, "and when he comes we will show him over all the properties he cares to examine."

Southeastern Water and Light Association Meets.—Seven Southern states —Alabama, Georgia, Mississippi, Tennessee, South and North Carolina and Florida—were represented at the three-day convention of the Southeastern Water and Light Association held at Chattanooga on May 19-21. As usual with this association, waterworks topics predominated, the electrical entries in the program being confined to a stereopticon display of modern meters by the General Electric Company, a paper on "Electric Watt-Hour Meters" by R. D. Hilley, district meter specialist

of that company, and a paper on "How to Sell Electric Ranges" by W. T. Christy, district sales manager of the General Electric. E. D. Reed, general superintendent of the Chattanooga district of the Tennessee Electric Power Company, read a paper on "Good Will as an Asset in Public Utility Operation." A. F. Porzelius, local manager of the City Water Company, Chattanooga, was elected president, and Jacksonville, Fla., was selected as the meeting place for 1926.

Ford to Develop Power at Huron River Near Ypsilanti. — The Fordson Power Company, a Henry Ford concern capitalized at $100,000, has filed application with the Michigan Public Utilities Commission for permission to develop water power on the Huron River near Ypsilanti. It is reported that a big dam and power plant will be constructed there and power sold to the public.

Maryland Commission Approves Merger.—Absorption by the Northern Maryland Power Company of the Elkton Electric Company and the Havre de Grace Electric Company of Harford County was approved last week by the Maryland Public Service Commission. Exercise of the franchises from the two concerns, its own franchise and another acquired from the Home Manufacturing Light & Power Company, also was approved.

Massachusetts "Lines" Men Hold Spring Meeting.—The Electrical Lines Club, composed of superintendents of distribution and other officials of electric light and power companies in Massachusetts, met in Lawrence last week for the spring meeting of the club and were entertained by the Lawrence Gas & Electric Light Company. Nearly every city in the state was represented. Irwin McD. Garfield, president of the Lawrence company, made the address at the annual dinner, being introduced by President Everett W. Cole of the club, superintendent of distribution for the New Bedford Gas & Edison Light Company.

Los Angeles Bureau to Install Carrier Current.—A contract to install a carrier-current telephone system for the Bureau of Power and Light of the city of Los Angeles has been awarded to the Western Electric Company. This system is to be used on the 110-kv. transmission line between Los Angeles and Power House No. 1 in San Francisquito Canyon, a distance of about 35 miles. Original plans call for one station at each terminal, but provision has been made for superimposing several more stations on the line as the need arises. It is expected that the system will be ready for operation in about five months.

Carrier-Current Telephony to Be Employed Between Cahokia and Crystal City.—A "wired-wireless" or carrier-current telephonic communication system was placed in operation on May 18 between the Union Electric Light & Power Company's power plant at Cahokia, Ill., and the Pittsburg Plate Glass Company at Crystal City, Mo., a distance of 35 miles. The inauguration of the high-tension line over this route was noted last week on page 1094. The cost of a private telephone line between the two plants would have been $40,000. The carrier-current system was installed at half that cost, and the initial tests were conducted with complete success.

Consolidation of Electric Service in East New Mexico.—Exploitation of an oil field near Artesia and the agricultural progress of the valley of the Pecos River, in eastern New Mexico, have brought rapid development of the electric power generating and transmission system of the Consolidated Light & Power Company of Roswell. This company has just announced that, in addition to the purchase of the electric light and power plants at Carlsbad, Artesia, Hagerman and Roswell, it will spend in the next six months about $250,000 for installing additional equipment and the construction of a 45-mile high-tension line now under way between Roswell and Artesia. Besides a new 1,500-hp. turbine which the company is installing in its main generating plant at Roswell, it plans to install an additional 3,500-hp. turbine in that plant by next January, it is stated. New engines are being installed in the plant at Artesia, and a transmission line will be built from the plant at Carlsbad to Loving, 12 miles. All of the towns between Loving and Roswell will be connected up with the transmission system, and many of the smaller towns in the valley will be provided with twenty-four-hour lighting and power service. It is expected that the availability of electric power for operating irrigation pumps in the Pecos River valley will bring about the reclamation of large areas of rich lands.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, January 3, page 76.]

American Association of Engineers—Orlando, Fla., June 2-5. C. E. Drayer, 63 East Adams Street, Chicago.

Electrical Supply Jobbers' Association—Hot Springs, Va., June 3-5. Franklin Overbagh, 411 S. Clinton St., Chicago.

Iowa Section, N. E. L. A.—Hotel Russell-Lamson, Waterloo, Iowa, June 3-4. H. E. Weeks, 623 Union-Davenport Bldg., Davenport.

National Electrical Credit Association—Atlantic City, June 6-7; Philadelphia, June 8-9. F. P. Vose, Marquette Bldg., Chicago, Ill.

Associated Manufacturers of Electrical Supplies — The Homestead, Hot Springs, Va., June 8-12. F. Nicholas, 30 East 42d St., New York.

Northwest Electric Light and Power Association (Geographic Division N. E. L. A.)—Gasco Bldg., Portland, Ore., June 12. W. A. White, Puget Sound Power & Light Co., Portland.

Pacific Coast Electrical Association (Geographic Division N. E. L. A.)—San Francisco, June 15. S. H. Taylor, 529 Rialto Bldg., San Francisco.

National Electric Light Association—San Francisco, June 15-19. M. H. Aylesworth, 29 West 39th St., New York.

Society for the Promotion of Engineering Education — Union College, Schenectady, N. Y., June 17-20. F. L. Bishop, University of Pittsburgh, Pittsburgh.

National Council Lighting Fixture Manufacturers and National Association of Lighting Equipment Dealers—The Ambassador, Atlantic City, June 17-19. Herman Plaut, 432 E. 23d St., New York.

American Society for Testing Materials—Chalfonte-Haddon Hall Hotels, Atlantic City, N. J., June 22-26. C. L. Warwick, 1315 Spruce St., Philadelphia.

American Institute of Electrical Engineers—United States Hotel, Saratoga, N. Y., June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

Michigan Electric Light Association—Grand Hotel, Mackinac Island, June 25-27. Herbert Silvester, 401 South Main St., Ann Arbor, Mich.

Empire State Gas and Electric Association (Commercial Section)—Schenectady, June 25-26. C. H. B. Chapin, Grand Central Terminal, New York.

East Central Division, N. E. L. A.—Breakers Hotel, Cedar Point, Ohio, July 14-17. D. L. Gaskill, Greenville, Ohio.

North Central Division, N. E. L. A.—Duluth, Minn., July 15-17. H. E. Young, Minneapolis General Electric Co., Minneapolis.

International Association of Municipal Electricians—Hotel Statler, Detroit, Aug. 17-20. W. R. Arbuckle, Bayonne, N. J.

Injunction Sought Against Skunk River Plant in Iowa. — Land owners above the site of the dam that the Iowa Electric Company of Cedar Rapids is building at Oakland Mills on the Skunk River have asked for an injunction, asserting that if the company is allowed to build this dam 300 ft. below the old dam and three feet higher, their land will be submerged. The company had planned to complete this dam with a new power house by early summer. It will be one of the largest water-power plants in Iowa and will develop three times the power formerly obtained from the Skunk River.

Johns Hopkins Falls in Line with Courses for Metermen.—In accordance with the now accepted practice of many engineering schools and colleges in all parts of the country, the school of engineering of the Johns Hopkins University, Baltimore, in co-operation with the Maryland Public Utilities Association, the Consolidated Gas, Electric Light & Power Company and the Maryland Public Service Commission, is offering a two-week course for metermen from June 1 to June 13. Requests for an advanced course also have been received, and the university is prepared to give such a course if a sufficient number of qualified men apply. Those interested are invited to write to Dr. W. B. Kouwenhoven, associate professor of electrical engineering.

Saluda Plant Will Have 650-Ft. Head.—Contracts for transmission lines and equipment for the Blue Ridge Power Company's new hydro-electric plant at Saluda, N. C., have been let through the offices of Mees & Mees, engineers at Charlotte. These contracts total about $800,000. The general contract will call for an expenditure of approximately $1,750,000. The plant, 4 miles from Saluda, on Green River, will be of 50,000 hp. capacity, with a 650-ft. head, among the highest in the East. The dam will be 172 ft. high and the tunnel, 10 ft. in diameter, will be 2½ miles long. Present plans of the company are for two units of 25,000 hp. each. The transmission line will carry 110,000 volts. The Blue Ridge company already has two small plants in operation in North Carolina, one at Tuxedo of 8,000 hp. and one at Tryon of 8,400 hp.

Men of the Industry

W. L. Abbott Heads A. S. M. E.

William L. Abbott, chief operating engineer of the Commonwealth Edison Company, Chicago, was nominated for president of the American Society of Mechanical Engineers at the recent spring meeting in Milwaukee. Mr. Abbott was born near Morrison, Ill., and was graduated from the University of Illinois in 1884. After graduation he went to Chicago and was early impressed with the possibilities in the electrical field which he had an opportunity to observe as an employee of the Van Depoele Electric Company. In 1885, with F. A. Wunder, he organized the Wunder & Abbott Illuminating Company, to supply arc-lighting service to the downtown district of the city, but two years later he disposed of his interests to the Chicago Arc Light &

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Power Company. Upon the completion of some construction work in which he was engaged for a short time he again formed a partnership with Mr. Wunder and T. Edward Tuttle, organizing the National Electric Construction Company to do general electric construction work. Subsequently Messrs. Tuttle and Wunder disposed of their interests to Mr. Abbott, who conducted the business until 1894, when the Chicago Edison Company purchased the company, Mr. Abbott continuing as president and general manager for another year.

In 1895 the business of the National Electric Construction Company was completely absorbed by the Edison organization. Mr. Abbott was then appointed chief engineer of the Harrison Street power house, and three years later he became chief operating engineer, the position he occupies at the present time.

Mr. Abbott has been a member of the American Society of Mechanical Engineers since 1891 and served as manager of that organization from 1907 to 1910. He is also a member of the American Institute of Electrical Engineers and the Western Society of Engineers. He has filled several offices in the latter and is a past-president. He has read many papers before these and other societies and has been a frequent contributor to the technical press.

Patrick Sullivan, formerly president of the Natrona Power Company, has been elected a vice-president of the Mountain States Power Company.

E. H. Coe, formerly connected with the Public Service Company of Colorado at Denver, has been appointed manager of the Central Arizona Light & Power Company, Phoenix.

Major Paul S. Reinecke will be designated to take over the duties of assistant chief engineer of the Federal Power Commission to succeed Major Edgerton, recently made chief engineer. Major Reinecke now is district engineer at Buffalo and field representative of the Federal Power Commission in that important hydro-electric district.

R. M. Coleman, who for many years has been manager of the electrical department of Fairbanks, Morse & Company, New York, has opened offices of his own under the name of R. M. Coleman Company at Long Island City.

Kenneth B. Aldrich, formerly electrical engineer for the Puget Sound Power & Light Company, Tacoma, Wash., has opened consulting engineering offices with B. W. Kibler, dean of the trade engineering department, City College, Tacoma

Samuel Insull, president of the Commonwealth Edison Company of Chicago, was elected president of the National Museum of Engineering and Industry at its annual meeting, May 21, in the Engineering Societies Building, New York. He is suceeding the retiring president, Dr. Elihu Thomson, head of the Thomson Research Laboratory of the General Electric Company. Mr. Insull was also elected chairman of the board of trustees.

J. C. Collins, formerly secretary and assistant treasurer of the Rochester Gas & Electric Corporation, has been appointed treasurer to succeed the late M. S. Barger. He will continue to be the company's secretary. The appointment of Mr. Collins to this position means the severing of his connection with the New York State Railways, where he has been assistant treasurer and secretary for many years.

R. T. Stephens, for the past two years division sales manager of the Sacramento division of the Pacific Gas & Electric Company, has been appointed manager of electric sales for that company in San Francisco. He succeeds H. E. Sandoval, who recently resigned to engage in business for himself. Mr. Stephens has been associated with the company since December, 1921, and has been engaged in sales work in nearly every division of the company. He has been active in the Pacific Coast Electrical Association and other electrical organizations.

C. W. Franklin has been appointed superintendent of the transmission and distribution department of the United Electric Light & Power Company, New York, succeeding C. T. Sinelair, who relinquished the duties of the office to join the Philadelphia division of the Duquesne Light Company of Pittsburgh. Mr. Franklin's service with the United began in 1916, when he was appointed as a cadet engineer. Subsequently he was appointed assistant superintendent of substations, and after two years he was promoted to be assistant to the electrical engineer of the company. This was the office in which Mr. Franklin was serving when he recently succeeded to the position of superintendent of transmission and distribution.

W. E. Wood New President of Southwestern Association

W. E. Wood, who was recently elected president of the Southwestern Public Service Association, as was announced in the May 16 issue of the ELECTRICAL WORLD, has been continuously identified with the electrical industry since his graduation from the Georgia Institute of Technology as an electrical engineer. During his career in the public utility field he has been associated with the Stone & Webster

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interests in various capacities. Beginning as an apprentice in Boston in that organization's statistical department, he was subsequently transferred to the Jacksonville Traction Company and in 1916 to Houston. The following year Mr. Wood received an appointment in El Paso, Tex., with the El Paso Electric Railway, and following a short connection there he became manager of the Galveston Electric Company. Two years later he returned to Houston as manager of the Houston Electric Company, the position he occupies at the present time. Mr. Wood is a native of South Carolina.

Major-General Sir Philip Nash, chairman of the board of directors of the Metropolitan-Vickers Electrical Company, Ltd., London, is on a visit to this country for the purpose of studying electrical developments. Sir Philip has spent some time in New York and will visit the Westinghouse shops at East Pittsburgh, traveling thence to Chicago. He will sail for home from New York June 9.

Fred G. Hamilton has been appointed assistant manager of operation for the Southern California Edison Company to succeed R. E. Cunningham, who has been made operating electrical engineer. Mr. Hamilton's promotion is the culmination of a long record of service

with the company and its predecessors. He began work with the Mount Whitney Power & Electric Company in 1899, and when that company merged with the Southern California Edison Company in 1917 he was appointed superintendent of the San Joaquin division. In 1924 he was transferred to the general offices as general superintendent of distribution, which position he has held up to the present time.

David Sarnoff, vice-president of the Radio Corporation of America, sailed for Europe May 23 on the United States liner *Leviathan* to consult with wireless interests. General Harbord, president of the Radio Corporation, as previously noted in the ELECTRICAL WORLD, went abroad two weeks ago for the same purpose.

George H. Clifford, vice-president and general manager of the Northern Texas Traction Company, Fort Worth, Tex., has been appointed Southwestern district manager for Stone & Webster. Mr. Clifford will supervise the street car systems of Fort Worth, Houston, Galveston, Beaumont, El Paso and Baton Rouge and the lighting systems in El Paso, Las Cruces, Galveston, Beaumont, Port Arthur, Lake Charles and Baton Rouge

Edwin L. Granau, formerly connected with the engineering department of the Blackstone Valley Gas & Electric Company at Pawtucket, R. I., has been transferred to the Eastern Texas Electric Company at Beaumont, Tex., as assistant superintendent of distribution. Both these utilities are operated by Stone & Webster, Inc., of Boston.

W. C. Lancaster, consulting engineer, has been appointed chief engineer of the Transit Commission of the State of New York to succeed the late John H. Madden. A graduate of the University of Virginia, Mr. Lancaster has engaged in important construction and designing engineering work in the East, the South and in Canada. He is a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and other engineering organizations.

Frederic A. De Lay has severed connections with the Chicago Central Station Institute (the educational bureau of the Insull companies). He has been connected with the institute since 1913, with the exception of two years during the war, when he was electrical superintendent of the Mechanical Appliance Company of Milwaukee. Mr. De Lay is an electrical engineer with more than twenty years' experience in the teaching and practice of electrical engineering. It is understood that he expects soon to enter business for himself.

Richard L. Hearn, assistant chief engineer of the Washington Water Power Company, Spokane, Wash., has tendered his resignation to enter partnership with H. G. Acres, who has been engaged in consulting work in hydraulic engineering, with especial attention to hydro-electric developments, having offices in Niagara Falls, Ontario. He is a graduate of the University of Toronto and spent several years with the Hydro-Electric Power Commission of Ontario, where he served under Mr. Acres, who was formerly chief engineer for the commission. During the construction of the Queenston development on the Niagara River, Mr. Hearn was chief draftsman, and in the last year of his connection with the commission he supervised the actual construction. In June, 1922, Mr. Hearn entered the service of the Washington Water Power Company at Spokane as hydraulic engineer and soon afterward was appointed assistant chief engineer. While a resident in Spokane Mr. Hearn was active in committee work for the Northwest Electric Light and Power Association and the National Electric Light Association.

Charles F. King, Jr., formerly connected with the Pennsylvania Railroad System, has entered the general engineering department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Obituary

Charles A. Russell, a member of the Massachusetts Public Service Commission from 1915 to 1920, died suddenly of heart trouble May 13 upon the steamship *Boston* while en route from New York to the Massachusetts capital. Mr. Russell was born at Canton, Mass., in 1855, was educated at Colby College and Boston University and practiced law for many years in his native state. His home was at Gloucester, Mass.

J. H. Hess, chief engineer of the Pittsburg plant of the Kansas Gas & Electric Company, died April 16 in his seventy-third year. A native of Baltimore, Mr. Hess went to Kansas in 1882, when he became identified with the waterworks at Independence and later at Cherryvale. Subsequently he went to Ottawa to supervise the building of the water and light plant. In 1890 he entered the employ of the Home Light, Heat & Power Company at Pittsburg as chief engineer, and when that property became a part of the Kansas Gas & Electric Company he continued in the same capacity.

Benage S. Josselyn, formerly president of the Portland (Ore.) Railway, Light & Power Company, now the Portland Electric Power Company, died suddenly in Portland, May 21. Mr. Josselyn resigned the presidency of the Portland utility in 1913 after six years of service as chief executive. Before going to Oregon he was well-known in public utility circles in the East, having been vice-president of the Baltimore Electric Power Company and the Maryland Telegraph & Telephone Company. During 1902 and 1903 he was general manager of the Hudson Valley Railway, Glens Falls, N. Y., and during the following three years he was general manager of the Union Terminal Railway, Sioux City, Iowa. Mr. Josselyn was sixty-seven years of age.

William Clark Hawkins, director, chief engineer and secretary of the Dominion Power & Transmission Company, Ltd., Hamilton, Ontario, died suddenly May 11 while on a fishing trip. Though an American by birth, Mr. Hawkins had been identified with the electrical industry in Canada since 1901, when he became secretary and manager of the Hamilton Light & Cataract Power Company. He was born in Orange, N. J., in 1866 and was graduated from the Stevens Institute of Technology in Hoboken with the degree of M. E. Before going to Canada he had been affiliated with several utility companies in the United States, including the Third Avenue Cable Company, New York; the Plymouth (Mass.) Electric Light Company, the Concord (N. H.) Land & Water Power Company and the Columbia (N. C.) Water Power Company. Mr. Hawkins was a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and other associations and clubs.

F. Y. Low, president of the Missouri Power Company of Ste. Genevieve, died at his home in Port Arthur, Tex., April 13, as the result of an apoplectic stroke.

John E. Cousins, for the past five years assistant manager of the service department of the Pettingell-Andrews Company, Boston, died at his home in Winthrop, Mass., on May 19. Mr. Cousins was born at Everett, Mass., forty-seven years ago and had been in the employ of the company for thirty years, serving chiefly in the sales department at the main office. He was one of the best informed and most popular men in the New England electrical supply jobbing field.

Robert Charles Cole, who for the past twenty-five years had been associated with the Johns-Pratt Company, died May 10 at Hartford, Conn. A native of New Haven, Mr. Cole entered the engineering department of the Johns-Pratt Company in 1900. He soon became assistant electrical engineer and from 1906 until 1922 had held the position of electrical engineer. He then became sales manager of the electrical division, in which position he continued until his death. Practically Mr. Cole's entire business career of more than a quarter of a century was spent with the Johns-Pratt Company. He started at a time when inclosed-fuse development was in its infancy and progressed with it to the various stages of development, production and merchandising. He showed marked engineering skill and ability as exemplified by numerous new developments and improvements for which he was responsible and was generally regarded as one of the foremost engineering experts on fuse protective, underground distribution and allied arts. Mr. Cole also had marked selling ability, and in addition to his strictly engineering and commercial skill he possessed the inventive faculty to a marked degree. Important work was done by him in the development of the present National Electrical Code standard for inclosed fuses. He was actively interested in the Associated Manufacturers of Electrical Supplies as a member of the Fuse Section, and he did excellent work on several of the important committees. He was a member of the A. I. E. E., the Hartford Engineering Club, and numerous social and charitable organizations.

Commission Rulings

Since Irrigation District Is Not a Public Utility, Commission Cannot Order Its Contract Price for Energy Reduced.—The California Railroad Commission in a decision affecting the San Joaquin Light & Power Corporation holds that since an irrigation district is not a public utility, the commission cannot require such a district to sell energy at a lower price than that to which it voluntarily agreed in a contract for the supply of surplus energy to the power company, although the commission might refuse to approve the contract as submitted. The commission holds that the question of principle raised by a consumer of the power company whose protest was directed against the general basis of the rate for energy rather than against the effect of this particular contract upon either the company or the district should not be urged to a point that would prevent the utilization of the energy available in the district's power house.

Commission Denies Jurisdiction Over Lines Carried Through Competitor's Territory on Industrial Company's Cross-Arms.—Proceedings before the Wisconsin Railroad Commission affecting a contract made by the Northern Paper Mills Company to lease cross-arm space on a power line to be built by it to the Wisconsin Gas & Electric Company were dismissed on the ground that the commission was without jurisdiction. The Northern Paper Mills Company had contemplated building a power line from Green Bay to White Rapids, Mich., for its own use, and the Wisconsin Gas & Electric Company also had planned to build a transmission line through that territory. The paper company had agreed to rent space to the electric company. The Wisconsin Public Service Corporation objected to the contract on the ground that no public utility concern had the right to build lines within its territory without the consent of the commission, inasmuch as such action would result in competition between the two companies. The Gas & Electric company said the line was merely for transmission and that there was no intention of tapping it or of serving any one in competition with the Wisconsin Public Service Corporation.

Rival Company Authorized to Operate in Territory Badly Served by Company Without Franchise.—The New York Public Service Commission has granted the Phillipstown Electric Corporation permission to exercise electric franchise rights in the village of Cold Spring and in the northern part of the town of Phillipstown and has denied the application of the Cold Spring Light, Heat & Power Company for authority to serve in the same portion of the latter town. In the opinion it was said: "Regarding the application of the Phillipstown Electric Corporation to operate in the village of Cold Spring, a delicate question is presented. The Cold Spring Light, Heat & Power Company is operating in that village without a franchise but with a definite investment, so that it is necessary to consider the advisability of permitting another company to occupy the same territory. We are, however, faced with a practical situation. The village board rejected an application of the Cold Spring Light, Heat & Power Company for a franchise as late as January 29, 1925, and granted one to the Phillipstown Electric Corporation. It also entered into a contract for street lighting with the Phillipstown Electric Corporation on February 6, 1925. It is clear that local sentiment is against doing business with the Cold Spring Light, Heat & Power Company despite the protestations of its new management that good service is assured. In view of the fact that on the one side we have a long record of unsatisfactory service and a refusal of the village authorities to do any business with the Cold Spring company, and on the other a company with a good record brought into this field by the petition of the residents of Cold Spring and awarded a contract for public lighting by the village authorities, it would seem that the public interest will be best served by granting the petition of the Phillipstown Electric Corporation to exercise the rights in the village of Cold Spring."

Recent Court Decisions

Representations of Minor Employee of Electric Service Company to Consumers Not Binding on Company.—The Supreme Court of Iowa held in the case of Adams vs. Iowa Gas & Electric Company that the company could not be held liable for statements made by a minor employee. Suit was brought by a group of citizens of the town of West Chester who claimed that when the company was granted a franchise in 1916 it had agreed to give electric service for the twenty-five-year duration of the franchise at the same rates as were specified for the first year in the contracts they signed. They based their case on statements made by a meter reader and lineman, since accidentally killed, who brought the contracts to them for signature. There was, however, nothing in the contracts as signed by the consumers and president of the company to show such an agreement, and the court held that the company could not be bound by an employee's oral statements. (203 N. W. 299)*

Company Cannot Repudiate Contract on Ground of Confiscation Without Due Authority.—A contract rate named in a franchise between a public utility corporation and a municipality cannot be abrogated by either party without the intervention of some higher authority, the United States Supreme Court has just declared, in effect, in a decision affirming the decision of the Florida Supreme Court in favor of the city of Palatka against the Southern Utilities Company. The municipality brought suit against the Southern company to restrain it from charging more than 10 cents per kilowatt-hour for commercial electricity, this rate being named in the franchise given the company by the city. The company pleaded that to compel it to charge no more than this rate would have the effect of depriving it of its property without due process of law and hence would be violative of the United States Constitution. This plea was overruled and the company declined to plead further, the State Circuit Court thereupon entering a decision for the city, which was affirmed by the State Supreme Court. The State Supreme Court held that the city had the power to grant the franchise and to enter into the contract and could not withdraw from such a contract, but conceded "the unfettered power of the Legislature to regulate the rates." Neither the Legislature nor any other governmental agency of proper authority having authorized a higher rate than that stated in the contract, the company could not violate its contract by charging a higher rate, the United States Supreme Court now declares.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Authority of Power Company to Condemn Right-of-Way Upheld.—Maintaining that a serious blow would otherwise be struck against the growing movement on the part of Wisconsin light and power companies to provide electric service to villages and rural communities, the Supreme Court of Wisconsin affirmed the decision of a lower court in favor of the Milwaukee Electric Railway & Light Company which involved the right-of-way for its new power line through the dairying and agricultural sections of Waukesha and Walworth Counties. Two land owners in East Troy resisted the right of the company to condemn a right-of-way through their properties for this line on the ground that a contract had been made with the electric company by another land owner. The company claimed that the contract was made in the settlement of pending litigation, and this contention was upheld.

Negligence Shown in Stringing Uninsulated Wire Over Sawdust Pile on Which Children Might Play.—In the case of Graham vs. Sandhill Power Company the Supreme Court of North Carolina affirmed the judgment of the lower courts giving damages to the plaintiff, who had been burned by contact with one of the company's transmission lines, uninsulated and carrying 11,000 volts. The plaintiff was a mentally deficient negro boy fifteen years of age who had been playing on a sawdust pile directly under the transmission line and had touched the wire. The company had recently built this line over right-of-way acquired from the government, and it passed close to a group of dwellings, the lower wire being 19 ft. above the ground. The line was directly over the sawdust pile, which was there when the line was strung, and the court held that the company should have known that children were likely to play there and that it had not exercised due care in placing the line. (127 S.E. 429.)

Manufacturing and Markets

Explaining Factory Repairs

Itemizing Work Costs on Appliances Helps to Better Understanding on Part of Customers

BY "OBSERVER"

IN MANY cases where a district office of a national manufacturer maintains servicing facilities for appliances used in home and office, and even for heavier apparatus, considerable lost motion exists between the repair department and the customer. If the volume of repairs is large in a given period, the factory branch office must organize this work to cut out as much waste as possible in time and labor, and a similar condition applies to central-station companies retailing electrical appliances and accepting the responsibility for their maintenance. Thus it comes to pass that the device is taken out of service and brought to the service station, often necessarily without informing the customer as to the nature of the trouble. The repairs are then effected and the device is returned with a bill for repairs (unless within the time limit of a free repair guarantee), with no statement of the nature of the defect or itemization of the work.

The process becomes too mechanical. Frequently the appliance owner has difficulty in finding out just what was done to the device, the delivery man from the service station often being in as much uncertainty as the appliance user. The device has gone through a certain routine and very likely has been made nearly as good as new; but there is little or no information on this point available outside the more or less complete record of the service station.

CUSTOMER'S INTEREST INCREASING

It is argued in some quarters that the average customer has little interest in anything but the performance of the device and that it is wasted time and paper to list repair items on return tags or attached envelopes. Recent observation leads to the opposite conclusion. Since the advent of radio into the home a rising tide of interest in all things electrical has been developing at a most rapid rate. Even though innumerable appliance users care nothing about these details, the number of those who desire to know the major items of repair work done upon apparatus for which they have spent money and for the maintenance of which they are also paying is increasing at a pace that justifies a more liberal policy in giving this simple information when the device is returned for service.

In the interest of encouraging all possible understanding on the part of users of their equipment, it is recommended that a repair schedule of some sort be attached to every return shipment from the service station. This will enable the delivery department to give intelligent answers to inquiries about the nature of work done and will automatically place in the user's hands information which he or she is entitled to receive without going to the inconvenience and expense of a personal call or the trouble of telephoning or writing for data at present too often embedded in service station bench books or card indices.

A Contract Basis Providing Acceptance Tests

EQUIPMENT and materials are in many cases purchased by utilities under contracts specifying complete payment in 60 to 90 days after receipt of the material. Then for various reasons postponement of the final payment is asked, when the furnisher of the equipment is legally entitled to payment according to the terms specified. To avoid the arguments which are likely to follow such procedure, and still leave each party to the contract his fair rights, contracts might be based on 50 per cent on delivery, 25 per cent thirty days after delivery, 15 per cent sixty days after delivery and 10 per cent on acceptance. The justification of such a basis is most apparent when it involves equipment which cannot possibly be erected and tested within the sixty-day or ninety-day term of most contracts. A provision in the contract allowing 10 per cent to be withheld until acceptance tests are satisfactory would meet most requirements without unnecessarily burdening the supplier and would furnish full protection to the purchaser.

Healthy Competition Produces Benefits

Manufacturer Tends to Become Loose When Orders Are Placed Without Requesting Bids—Competition When Sought Should Be Real and Not Fictitious

BY A BUYER

COMPETITION in the purchase of equipment has always been productive of lower prices. If the buyer is to reap the benefit of healthy competition, then he must stimulate it. Every manufacturer from time to time receives orders for certain equipment without competition because his product has proved satisfactory, but it does not follow that such a practice should lead the buyer to place orders indiscriminately with a certain supplier because some particular piece of equipment fills his needs.

There is occasionally a tendency to overdo this, and the buyer forgets to bear in mind that the very beneficial condition which is produced by competition is lost when this method of buying is used. Inevitably when a manufacturer has a market tied up he tends to get loose and the buyer does not get the benefit of the lowest price. Deliveries also may not be so good as they otherwise might be, although this point, being usually an important factor, is watched more carefully by both buyer and manufacturer. Some cases have recently developed where a buyer paid more money for equipment because he did not foster competition. While it is true that cases do arise where the purchaser can for his best interests place an order without competition, still it is best to watch this system closely and not to place such orders without a very justifiable cause.

When competition is engendered it should be real and not fictitious, as it can easily become. To illustrate this a definite case can be cited in which a buyer, although asking for quotations from a number of sources, had in nearly every case placed his order with the same manufacturer. The result was that the various bids soon became purely a formality. Each salesman knew that his chances of securing an order was nil, and so he never quoted his lowest price, since previous experience had shown that such a price was only a means of bringing the successful manufacturer's quotation down to that level. The favored manufacturer's price was thus always lowest, and as he knew that the business was assured there was no effort to quote the lowest figures.

After a while it became evident to the buyer that real competition was lacking, so he called in the various salesmen and had a "heart-to-heart" talk with them and assured them that he wanted it fully understood that their best prices were to be quoted from then on, as he had reason to believe that this had not been practiced hitherto, and he in turn would give every bid fair consideration solely on its merits without showing any favor. A day or two later quotations were requested on a 60-hp. slip-ring motor and control equipment. The previously favored manufacturer did not receive the order because a better price and delivery was obtained elsewhere. Following this several orders were placed for synchronous and other motors and control equipment, motor-generator sets, etc. With the exception of two 5-hp. motors driving pumping equipment, which were purchased direct from the pump manufacturer, the previously favored manufacturer did not receive a single order as he had not yet got out of the rut of self-complacency. But with all these orders placed elsewhere the company's salesman began to get worried. Hence on future bids competition was keener, but although he was able to receive

future orders, he never again enjoyed a monopoly, much to the buyer's benefit.

About six months later this buyer was in the market for a very large amount of equipment for use overseas in considerably enlarging a manufacturing plant. Much of the original equipment in this plant was formerly purchased from the favored manufacturer. Under previous conditions other manufacturers would have been loath to furnish the necessary time and engineering collaboration required on so large an undertaking, because they would have felt that their efforts would be futile and they would rather have devoted their energies to a more fertile field. But under the new order of healthy competition the buyer secured more and better engineering advice and with profit to himself was able to distribute the orders among various companies. Thus under a system of real competition the purchaser not only was able to obtain better prices and deliveries but also procured more engineering talent and recommendations from which to make a selection.

In another case a buyer placed an order without competition for approximately $4,000 worth of switching equipment to be furnished according to his own layout. To meet an identical condition another purchaser requested quotations from five manufacturers and was able to utilize the engineering talent of all five and thus select the best layout. Moreover, the equipment, which was exactly similar to that ordered by the first buyer, was obtained for somewhat better than 10 per cent below the price that was paid in the first case.

It must be borne in mind, however, that there are extenuating circumstances where the buyer wants to place orders for certain equipment with one manufacturer to keep the apparatus uniform or in some cases to simplify maintenance problems or for various other reasons. But, again, it must be pointed out that there is danger of carrying this practice too far and that the buyer should analyze carefully his reasons for placing orders without competition before it is done.

Business Conditions

ACTIVE construction work by central-station companies has been responsible for the majority of orders placed this week with electrical manufacturers. Several reports indicate that a number of negotiations are under way in connection with central-station extension and improvement work. Industrial firms are also placing fair orders for material. Buying still remains conservative and for immediate requirements, in the belief that price reductions on other apparatus, following those made recently on motors, may be announced; but there is no foundation for this attitude. A phase of the present condition is that all orders call for very prompt deliveries.

The large increase in the price of rubber has created a certain uneasiness among wire manufacturers. No increases have yet been announced as no company is desirous of taking the initiative in a business so highly competitive, but the situation must soon become serious for those manufacturers who have no large stocks of rubber. A large wire company says that sales are good, but some extremely low prices are being quoted in certain instances by competitors.

In New England there is an encouraging activity in the sale of electrical equipment, and street lighting is active in Rhode Island and New Hampshire. Central-station equipment is in good demand in that district, and appliance sales are active. Some good orders were placed in the New York district by central-station companies, and the demand for construction materials is active. In general, central-station orders placed in that district are steadily increasing. In the Southeast the general expansion programs of utility companies are productive of good orders for all classes of construction materials. There is a brisk demand for cable in the South for use in the installation of "white-way" equipment. Business in the Middle West is on an even basis with the tone optimistic. Buying of equipment by the various utility companies continues and construction work is rapidly proceeding, On the Pacific Coast some good special orders were placed, but the general run of orders are low in amount and are expected to continue so until prices are steadier and a line can be obtained on the year's crops.

Steady Increase in Sales of Washing Machines

A STEADY increase in the sales of all types of washing machines is shown in the first-quarter report of 1925 issued by the American Washing Machine Manufacturers' Association, as compared with the last quarter of 1924 as well as the corresponding period in 1924. The number of sales reported for the first quarter of 1925 are: Hand-power, 25,174; water-power, 5,475; gas and power, 6,762; electrics, 160,353—making a total of 197,764. The total for the last quarter of 1924 was 181,802, of which 152,483 were electrically operated. For the first quarter of 1924 total sales were 179,461, with the electric machines numbering 148,847.

Copper Consumption This Year Compares Favorably with 1924

THE domestic consumption of copper during the first half of 1925 will, from all indications, compare favorably with that during the same period of 1924, according to George A. Sloan, secretary of the Copper and Brass Research Association. Consumption of copper in the United States during 1924 established a post-war record by exceeding 1,500,000,000 lb.

"While it is true," said Mr. Sloan, "that shipments during the early months of the year showed a temporary recession in copper's principal consuming field, the electrical industry, this was more than offset by increased tonnages in practically all other industries. The automobile remains our largest consumer of copper in the mechanical field, while the increased activity in railroad-car and locomotive construction during the first quarter of the year had its corresponding effect on copper tonnages."

Ontario Regulations Governing Sale of Electrical Products

THE Ontario (Canada) regulations governing the sale of electrical equipment are to be strictly enforced hereafter, Trade Commissioner L. W. Meekins advises the Department of Commerce, A number, assigned by the Hydro-Electric Power Commission, should appear on all approved products offered for sale in the Province of Ontario. Failure to do this may result in prosecution of the dealer and exclusion of the manufacturer from that market.

Average Size of Oil Engine Increasing—Demand Up

THE average size of oil engine reported sold by a large manufacturer for power-plant service during 1924 was 700-hp. capacity, an increase of slightly over 100 hp. above the average size sold in 1923 for the same service. A number of inquiries are in the hands of manufacturers for oil engines for power-plant service in sizes of 2,500 hp. and 3,750 hp. Attention is called to the fact that during the past five years there has been very little fluctuation from the average in the price of fuel oil and there has never existed a shortage or difficulty in securing delivery.

Prices of oil engines during 1924 are said by manufacturers to have been too low and have not represented a fair profit on the actual cost. There were no definitely established prices on engines during 1924 as quotations were made on each competitive job in accordance with the needs of the different companies for work and depended entirely on the condition of shop production of the various companies. It is believed that the price trend will be upward, owing to the limit as to the amount of business which any company can take just to keep its organization together. Indications are that sales this year will be very good. Orders have come in with increasing frequency, and there has been a considerable increase in requests for quotations, some showing interest, others indicating purchases, if not in the immediate in the near future. There has been an increasing demand for marine engines, which activity will probably have an effect on prices and deliveries for stationary engines. Deliveries on stationary engines up to 1,500 hp. can be made within three months in most sizes and not longer than five months on others. On 2,500-hp. and 3,750-hp. sizes deliveries can be made in about ten months.

German Electrical Equipment Exports Show Decrease

THE total value of Germany's exports of electrical equipment during 1924 was 290,612,000 marks, which was nearly equal to that of the previous year and only about 10 per cent below

1913, according to the electrical equipment division of the Department of Commerce. A noticeable falling off has taken place in the exportation of electrical machines and transformers. The total value in 1924 amounted to only 45,800,000 marks, as against 55,000,000 in 1923 and 64,400,000 marks in 1913. The sale of medium and large sized electrical machines has decreased, while that of small machines has increased. Exports of cable and insulated wire during 1924 were somewhat higher than those of the previous year, but much lower than those of 1913. A steady downward trend has existed in the exportation of incandescent lamps, the value in 1924 being only 48 per cent of that for 1913. Although not so marked, a similar trend obtained in wiring materials. With the exception of storage batteries and cooking and heating apparatus, exports of most electrical manufactures from Germany have failed in recent years to reach the prewar totals, though a great increase, owing largely to the development of radio, took place in the telegraph and telephone apparatus class. Most of the electrical equipment exported from Germany during 1924 went to other European countries; in countries outside of Europe the demand was relatively small.

Demand for Copper Light—Lead Active—Price Again Increases

NO APPRECIABLE amounts of copper have been sold during the week, and consumers are purchasing only for current requirements, although producers show no disposition to force sales, feeling that though business is moderate it is satisfactory. The lead market is strong with little material available for early delivery. Copper producers are still nominally quoting 13⅝ cents, but some concessions are being made. Some business, though not very large, was transacted with consumers in the Connecticut Valley at 13.55 cents for delivery in June and July. European offerings at lower prices have lowered the demand of the metal for export. Since the middle of April the price of copper has varied within narrow limits — which is not customary with this metal. A principal reason for it is the fact that London prices have not fluctuated much.

The contract price of the American Smelting & Refining Company for lead was increased to 8¼ cents on Monday, May 25. Purchasers in the open market have been compelled to pay ¼ cent to ½ cent more. The market has been strong and little lead has been available for early delivery. The London market has been strengthened as a result of the price advances here. Zinc has increased slightly in price and galvanizers have shown a little more interest, but they are not willing to pay the higher price. The strength of the market has been owing chiefly to the good buying by brass mills and an increased amount of metal sold to Europe.

The price of tin in London has been steadily advancing with the New York price following the lead. Consuming demand has been inactive except for a large inquiry reported received from a steel mill, covering 5 tons for June.

NEW YORK METAL MARKET PRICES

	May 20 1925 Cents per Pound	May 27, 1925 Cents per Pound
Copper, electrolytic	13.6	13⅝
Lead, Am. S. & R. price	8	8¼
Antimony	17	17
Nickel, ingot	31	31
Zinc, spot	7.25	7.45
Tin, Straits	54	56
Aluminum, 98 to 99 per cent	28	28

Base copper price May 27, 1925, 16 cents.

Delinquent Electrical Accounts Again Decrease in April

COMPARING April with the preceding month, the number of delinquent accounts reported to the National Electrical Credit Association again showed a decrease as a whole. In New England and in the Philadelphia district there was a fair increase in the number of accounts reported and in the total amount, but the average amount decreased. In all territories the average amount decreased except on the Pacific Coast, where a slight increase was noted.

DELINQUENT ACCOUNTS IN APRIL

Branch and Month	Number of Accounts Reported	Total Amount	Average Amount
Central Division:			
March, 1924	941	$99,989.14	$106.26
March, 1925	1035	123,857.54	119.67
April, 1924	871	110,326.40	135.04
April, 1925	964	107,660.66	111.68
New York:			
March, 1924	445	68,022.00	153.00
March, 1925	462	69,232.00	150.00
April, 1924	471	64,648.00	138.00
April, 1925	554	66,989.00	120.00
Philadelphia:			
March, 1924	233	26,163.85	112.29
March, 1925	220	29,438.68	133.81
April, 1924	221	25,313.95	114.54
April, 1925	298	30,265.58	101.56
New England:			
March, 1924	46	4,708.60	102.36
March, 1925	77	7,516.66	97.62
April, 1924	35	4,442.94	126.94
April, 1925	118	10,466.92	88.70
Pacific Coast:			
March, 1924	12	1,175.31	97.94
March, 1925	23	1,868.54	81.24
April, 1924	31	3,869.93	124.84
April, 1925	19	1,570.74	82.67

Sales of Construction Materials Active in the Southeast

GENERAL expansion programs of central-station companies in the Southeast are well under way, and good orders are being placed for all classes of construction materials ranging from 2,300-volt standard distribution material to 110,000-volt high-tension equipment. Several new projects for the installation of notable "white-way" systems are under consideration and the installation of such equipment recently purchased has caused a brisk demand for cable. Industrial purchases are quiet, except in the Birmingham district and in isolated instances where mills are changing from mechanical to electrical drive. One jobber reports the receipt last week of an order for a 1,000-watt radio broadcasting station to be installed in a Florida city.

With the exception of central-station purchases of line and construction materials, which are still very satisfactory, jobbers report a slowing up in practically all lines, though there are exceptions here and there where virgin territory is being developed by the entrance of central-station companies into the merchandising field. Electric ranges are selling satisfactorily in those sections that offer an attractive electric cooking rate. Flatirons have been selling well owing to special campaigns during the past few weeks, and prospects are for good sales for several weeks to come. Lamp sales are excellent.

Crop reports for the Southeastern States are generally optimistic, particularly as regards the tobacco and peach crops in Georgia. The value of the tobacco crop is estimated at $15,000,000 and the volume of the peach crop at 12,800 cars. Labor is reasonably well employed. Despite the quiet tone of business at this time, the outlook is satisfactory for late summer and fall business.

Good Special Orders Placed on Pacific Coast—Business Fair

THE general run of orders on the Pacific Coast are low in amount and are expected to continue so until prices are steadier and a line can be obtained on the year's crops. There are, however, some excellent orders for particular items. Among recent export orders is one for 300,000 ft. of No. 17 copper-clad wire totaling nearly $4,000 and 200 pocket meters. Other domestic orders include two thousand 7,500-volt line switches for southern California and $14,000 worth of park cable for the city of Oakland. The latter municipality has also ordered 126 lighting fixtures and the necessary control and wiring material for the Lake Merritt unit of its new lighting system, this portion of the order totaling about $12,000. A railroad order covered 40,000 double-petticoat glass insulators, It is estimated that about 100,000 of this style have similarly been purchased this year, the bulk of the business having gone to a Los Angeles manufacturer. A recent railroad bid covered an exceedingly large quantity of miscellaneous wiring material.

A number of orders for bare and weatherproof wire and several tape orders were placed, mainly by industrial firms. When power company business finally catches up the year lost by the drought some very good business is expected. Credit conditions are good, despite competitive conditions in Oakland, where enormous building expansion has attracted many newcomers. In Seattle an "Own your home" week, an electric home and an "electric wedding" are expected to stimulate interest and sales. Construction is holding up well and the lumber business is slowly becoming stabilized.

Good Selling Tone in New England—Appliance Sales Active

AN ENCOURAGING activity in the sale of electrical equipment is reported by both manufacturers and jobbers throughout New England during the past week. Central-station equipment is in good demand. The Bradford (Vt.) Electric Company has contracted for station and line equipment amounting to about $70,000, and one jobber reports a very active interest in wire, sockets, poles and line hardware, while another maintains an encouraging level in sales amounting to about seven cars of poles and cross-arms per week. Small motors are selling singly or in

small-lot orders. One large cotton company is reported to have installed 1,041 motors totaling 1,022 hp. recently, but in general other factories incline to gradual replacement methods. Street lighting is active in Rhode Island and New Hampshire. House wiring continues to hold interest, with accompanying strong demand for meters, sockets and fixtures. Several complete electrical equipments for domestic training are reported closed for new schools in this district.

The turnover has been particularly good in household appliances owing to seasonal selling campaigns. One manufacturer reports the sale of more than two thousand electric flatirons during the past two weeks. An active demand is also reported for washers, cleaners, lamps and electric ranges. One group of central-station companies reports 15 per cent increase in sales for the week ended May 16, as compared with the corresponding week in 1924, and an electric company reports more than 7 per cent increase in appliance sales for a similar period and records doubling the sales volume during the past six years.

Business in the Middle West on an Even Basis—Feeling Optimistic

THE volume of business transacted in the Middle West is somewhat smaller, although a cheerful tone prevails. Buying of equipment by the various utility companies continues and construction work is rapidly proceeding. Industrial plants that expanded too rapidly are working on a shorter production schedule. Among the items of interest this week was an order for $110,000 covering 600-amp., 15,000-volt totally inclosed truck-mounted oil switches. Pole-line hardware, insulators, etc., are in good demand, with a fair demand for motors.

Jobbers' sales have fallen off a little with the slower general business conditions. Very unsatisfactory weather conditions have retarded fan sales, although the season is expected to open up soon. Appliance sales have accelerated somewhat, flatirons in gift boxes leading in volume of sales. Prices are generally firm, with a stiffening in lead. Lead sleeving advanced 30 cents per 100 lb. Stiff increases in crude rubber make an advance in code-wire prices seem inevitable. Manufacturers in this territory admit they are expecting to quote higher figures.

Good Orders Placed in New York District—Construction Active

SOME good orders were placed in the New York district this week by central-station companies. Included in the equipment purchased are sixteen 2,000-kva. transformers as well as some miscellaneous units. Proposals have also been requested on part of the transformer equipment for the Hudson River vehicular tunnel. This request should amount to between $40,000 and $50,000. Inquiries from utility companies for quotations have been slowly increasing over the past two months with orders being placed in similar proportion.

Sales to industrial plants have been good. One manufacturer reports that sales of motors so far this year are 25 per cent better than for the same period last year. Various reports indicate that no increased business has resulted from the recent price reduction, while, on the other hand, another manufacturer reports that cases have come to his attention where utility companies and other buyers are withholding purchases in the belief that reductions might be announced on other equipment. This attitude on the part of buyers is confining purchases to immediate requirements.

It is noticeable that all buyers are calling for prompt deliveries. A switching manufacturer reports that his sales in this territory are consistently ahead of those made last year, and a controller company also classes business as good. Sales of supplies by jobbers are steadily increasing, with an improvement of about 5 per cent noted as compared with last year. Radio sales, however, are completely off.

Construction materials are especially active as are also lamps. Wire prices are holding firm but there is certain uneasiness among wire manufacturers because of the increased price of rubber.

Activities of the Trade

General Electric Receives Order for Illinois Central Railroad

The General Electric Company has received an order from the Commonwealth Edison Company of Chicago for all of the synchronous converters for the seven substations now being built to supply 1,500-volt direct current to the suburban electrified zone of the Illinois Central Railroad. Included in the order are twenty-two 1,500-kw. synchronous converters, two 1,500-kw. mercury-arc rectifiers and transformers totaling 37,800 kva. The company has also received an order from the Illinois Central for control equipment and motors in addition to those covered in the order of last fall.

Riley Stoker Arranges for Representation in Germany

Negotiations have just been completed by the Riley Stoker Company, Ltd., London, whereby Riley, Jones, Murphy and Harrington stokers will be made and sold in Germany by the Deutsche Evaporator-Aktiengesellschaft of Berlin. The combustion products and service of the Riley Stoker Corporation, Worcester, Mass., are now available in nearly all parts of the world through associated companies, licensees and agents.

Superior Refrigeration to Make Domestic Machines

Two types of electric refrigerating machines for household and commercial uses have been announced by the Superior Refrigeration, Inc., Lima, Ohio. Four air-cooled models are available in equivalent ice capacities ranging from 75-150 lb. to 450-650 lb. There are also four models of water-cooled machines of the capacities just given. Prices of the units range as low as $300 f.o.b. factory.

The company, which was first organized about twelve years ago for the manufacture of refrigerating machines of from 3 tons to 5 tons capacity, was reorganized last winter with E. A. Williams, Jr., as president. Mr. Williams was for ten years president and active directing head of the Garford Motor Truck Company. Associated with Mr. Williams as owners and directors of the reorganized company are A. W. Wheatley, F. L. Maire, Frank Komminsk, Fred W. Cook, Roy S. Layton and Frank Andrews. The company has already extended its manufacturing facilities to meet the demand and reports that connections have been made with several large central-station companies and electrical dealers to handle Superior products in many of the principal cities.

Copeland Products, Inc., Detroit, manufacturer of domestic refrigerators, has moved its factory from Flint, Mich., to Detroit. The Detroit factory has been planned and laid out with new machinery and equipment for large production. The company announces that the number of units being turned out at the present time is being increased rapidly, and it is expected that 100 per day will be reached shortly. It is said that fully 90 per cent of Copeland products will be built within its own plant.

The Century Electric Company, St. Louis, manufacturer of alternating-current motors and fans, announces that its general office is now at 1806 Pine Street, St. Louis.

The Webster Manufacturing Company, 4500 Cortlandt Street, Chicago, manufacturer of material-handling equipment, announces the opening of a branch sales office at 811 Magee Building, Pittsburgh, in charge of E. E. Landahl.

The Philadelphia Storage Battery Company, 37 Spear Street, San Francisco, with headquarters at Ontario and C Streets, Philadelphia, has completed plans for a new two-story building on Fremont Street for factory and office service, 50 ft. x 150 ft., estimated to cost about $42,000, and will proceed with the erection of the building at an early date.

The Trumbull Electric Manufacturing Company, Plainville, Conn., manufacturer of electrical supplies, announces that it has placed on the market a tumbler switch, in a special galvanized-finish box, 2⅜ in. x 4 in. x 1⅛ in. This switch has been especially adapted for use with fractional-horsepower motors.

H. E. Molé, consulting engineer, announces the removal of his offices to 90 West Street, New York.

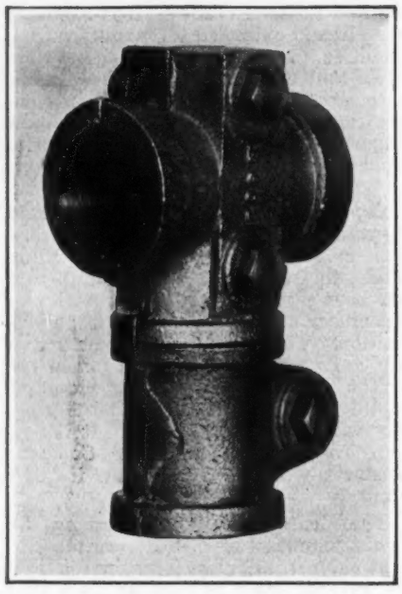
The Stearns Conveyor Company, Cleveland, announces the opening of a new branch office in Kansas City, Mo., at 3233 Roberts Street, with R. J. Hanna in charge. To facilitate sales work the company has taken larger quarters at 935 Singer Building, New York City. The company also announces that it has taken on the general distribution for the United States of the Messiter conveyor scale, which is designed to weigh a moving load while on a conveyor.

The Timken Roller Bearing Company, Canton, Ohio, announces that it has purchased the physical assets of the Gilliam Manufacturing Company. The production of both Timken bearings and Gilliam bearings will be continued in their respective plants.

New Equipment Available

Connector

A line of connectors known as the "Edco," which are said to have ample conductivity and to be rugged and simple, have been placed on the market by the Tidewater Electric Company, Inc., 29 Park Place, New York.



"EDCO" CONNECTOR FOR COPPER TUBING

The line covers T-connectors for every possible combination of tubing, cable and bus work, through connectors, angle connectors, grounding lugs, etc.

Welding Set.—A new engine-driven welding set has recently been added to the General Electric line of welding equipment. This outfit consists of a standard "WD-12" welding generator driven by a Buda heavy-duty four-cycle engine, all mounted on wooden skids to facilitate moving from place to place. The new outfit is being marketed complete with all accessories and ready for use.

Lever Switch.—In a new lever switch marketed by the General Electric Company, bearing the designation "LP," there are no joints in the current-carrying portions and no soldered or sweated joints in any part of the device, except at the hinge and at the contact clip. The switch has a two-piece blade, consisting of a single length of metal bent double. Stud, dowel-pin, blade-stop, clip-block and clip are combined in one solid forging. The switch is at present made in capacities of 30 amp., 60 amp. and 100 amp., but it is expected that a full line of capacities will eventually be available.

Watt-Hour Meters

A single-phase as well as a polyphase watt-hour meter has been placed on the market by L. H. Junod & Company, 104 Fifth Avenue, New York, agent for Landis & Gyr, Zug, Switzerland. These meters are provided with a lower "footstep" bearing of the inverted jewel type which runs on a fixed steel pivot and is said to insure sustained accuracy. The house-type meter weighs only 4 lb., and the polyphase meters are all bottom-connected. A three-element meter for three-phase, four-wire circuits is also available. A four-dial pointer register can be furnished with any of these meters.

Color Projector

For changing and transposing the color combinations in patterns and designs of every description the Chromoscope Company, Ltd., Walmar House, 296 Regent Street, London, W 1., has placed on the market an instrument called the "Mutochrome." The picture of the pattern or design is projected in color with this instrument, and each element of the design may be varied independently as to color and brightness with rapidity. The "Mutochrome" is also a camera and is used in this connection to photograph (on one plate only) the different elements of the design. At the present time the company is represented in America by W. W. Clarke, care of L. O. Thompson Company, 244 Madison Avenue, New York.

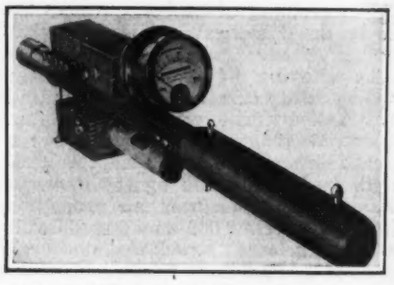
Demand Meter

The Type G demand meter, made by the General Electric Company, has recently been changed and improved. The stylus actuating mechanism is equipped with a totalizing register, thus providing a means of checking the number of impulses recorded by the demand meter against the reading of the watt-hour meter. Other changes include the use of a double-coil armature construction to replace the spring-return type, the use of the three-wire type of contact, a modification in armature construction, eliminating any tendency of the stylus to "overshoot," even on appreciable over-voltage, and the use of an adjustable zero stop. The thermostat has also been improved.

Insulator Tester

A new type of live-line testing stick that permits quantitative comparisons, is a direct-reading device and is adaptable to testing any type of insulator, as well as being applicable to other purposes, has been developed by the Iler Electric Service Company, 25 Boardman Street, Youngstown, Ohio. In this instrument the calibration is such that the unit is shown as "good" if it carries approximately its normal voltage (depending on its position in the string), as "partly defective" if the voltage is slightly below normal and as "bad" if the voltage is well below normal. The instrument can also be used for testing insulators on transformers, circuit breakers, etc., as well as for ascertaining whether a line is alive or for other purposes.

The device consists of a long stick with a minimum length of 10 ft. At the tip of the stick is a detachable metal contactor. Several different shapes may be used to adapt it to different types and shapes of insulators. The instrument proper consists essentially of a radio amplifier circuit, in the plate circuit of which is the meter giving the direct reading. The amplifiers are isolated from the test stick by an inductively coupled winding. The complete device weighs 14 lb. The instrument illustrated is suitable for all voltages from 2,000 to 132,000. Above and below these voltages it is necessary to change the voltmeter for another one of different calibration, but this can be done in a few seconds.



ILER LIVE-LINE TESTING DEVICE FOR LOCATING DEFECTIVE INSULATORS

Motor for Circular Saw.—A special motor of the three-phase induction type, with one side flat to permit easier access to the saw, has been placed on the market by Forbes & Myers, 172 Union Street, Worcester, Mass. The saw is mounted directly on the motor shaft, which is ball-bearing-equipped. The stator winding has all the wires omitted from one side, the unbalance being compensated for by altering the wires on the opposite side.

Calibration Tank for Thermometers.—A tank for calibrating thermometers to temperatures up to 600 deg. has been placed on the market by Harold E. Trent, 259 North Lawrence Street, Philadelphia. The heating units are spaced around the outside of the tank to obtain even heat. A copper shell is used filled with oil, while for higher temperatures a steel shell is used filled with salt. The switches control two series of units each and are interconnected with magnetic switches.

New Trade Literature

DISTANT DIALS.—The Sangamo Meter Company, Springfield, Ill., has issued bulletin No. 69, entitled "Sangamo Distant Dials," in which it describes the Sangamo distant dials which are used with watt-hour meters for duplicating at a convenient location the reading of the meter register, for totalizing the revolutions or strokes of engines, generators or other machines, or for summing on a single dial the total registration of a group of watt-hour meters.

TRANSFORMER COOLING UNIT. — "Transformer Cooling the Natural Way" is the title of bulletin No. 101 issued by Hanson, Jones & Morey, Haas Building, 219 West Seventh Street, Los Angeles, which describes and illustrates the "H-J-M" transformer cooling unit. A description of the operation of the cooling unit is included.

ELECTRIC DRILL. — Bulletin No. 107 issued by the Hisey-Wolf Machine Company, Cincinnati, describes and illustrates the new Hisey standard duty half-inch Universal drill.

CANOPY TYPE SWITCHES.—The E. H. Freeman Electric Company, is distributing a leaflet covering its "Circle F" canopy switches, designed for use with shallow-spun or cast canopies.

WATER-COOLING APPARATUS.—The Delco-Light Company, Dayton, Ohio, is distributing a folder calling attention to the "Frigidaire" equipped water coolers for use in factories, offices, schools, restaurants, hospitals, etc. Illustrations are given showing the air-cooled type and the water-cooled type "Frigidaire" compressor.

MATERIAL-HANDLING EQUIPMENT. —The Elwell-Parker Electric Company, Cleveland, has issued catalog No. 140, covering its material-handling equipment, including electric storage-battery industrial trucks, tractors and cranes, etc. Illustrations are given showing its various "tructors," tractors, cranes, etc., in action. Specifications are also included.

ELECTRIC HAIR DRYER AND VIBRATOR.—The Shelton Electric Company, Long Island City, N. Y., is distributing a circular calling attention to its electrical devices, including the new Shelton hair dryer and its "Ideal" pedestal vibrator.

INDUCTION MOTORS AND FREQUENCY CHANGERS. — Bulletin No. 41,521-B, entitled "High-Speed Induction Motors and Frequency Changers," issued by the General Electric Company, Schenectady, N. Y., describes and illustrates a complete line of motors, alternators and frequency changers adaptable for application on modern high-speed wood-working machines and of machine tools requiring high-speed drive. It also contains photographs, diagrams, tables, etc., relating to the above apparatus.

FLOOR DISTRIBUTION SYSTEMS.—The Russell & Stoll Company, 53 Rose Street, New York City, is distributing a folder announcing that its "R. & S." line of electrical fittings has been augmented by the "Number 2696," which, together with the "R. & S." bushed standpipe, may be used for high-tension and low-tension applications for light and telephone or other similar requirements in banks and offices.

FRACTIONAL - HORSEPOWER MOTORS.—Circular No. 1,257, issued by the Robbins & Myers Company, Springfield, Ohio, covers its type "RF" fractional-horsepower repulsion-induction motors. This motor is manufactured in ratings of ⅛, ¼ and ½ hp.

BOILER-ROOM OPERATION.—The Republic Flow Meters Company, 2240 Diversey Parkway, Chicago, has issued (Article V) entitled "Preliminary Plant Survey," which is one of a series on boiler-room operation in which it gives general instructions for the maintenance of high operating efficiency of boiler plants.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase and agency is desired in Constantinople, Turkey (No. 15,094), for cables and wires.

An agency is desired in Liverpool, England (No. 15,139), for electrical supplies, and radio sets and parts.

An agency is desired in Prince Rupert, British Columbia, Canada (No. 15,173). for electrical household novelties.

An agency is desired in Paris, France (No. 15,140), for electrical machinery and for wire and wiring supplies.

Purchase is desired in Kovno, Lithuania (No. 15,138), of a 1,000-watt radio broadcasting station.

An agency is desired in Toronto, Canada (No. 15,141), for insulated wire staples.

Purchase and agency is desired in Brussels, Belgium (No. 15,110), for conveying and lifting machinery.

New Incorporations

THE BUFFALO, NIAGARA & EASTERN POWER CORPORATION, Niagara, N. Y., has been incorporated by C. R. Huntley, 121 Main Street, Lancaster; W. P. Cooke, 155 Sumner Street, and D. J. Kenefict, 841 Delaware Avenue, Buffalo, to generate and distribute electricity. The capital stock consists of 4,000 shares of no par value. Cohn, Chormann & Franchot, Niagara Falls, N. Y., are attorneys.

THE CENTRAL FLORIDA POWER & LIGHT COMPANY, St. Petersburg, Fla., has been incorporated with a capital stock of $50,000 by B. M. Latham and T. C. Ervin.

THE PEOPLE'S UTILITY COMPANY, Martinsville, Va., has been incorporated with a capital stock of $10,000. The officers are W. C. Spencer, president, and Henry Belcher, secretary.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

SALEM, MASS.—The Salem Electric Lighting Company plans extensions in power facilities and transmission system.

SPRINGFIELD, MASS.—A proposition has been submitted by the United Electric Light Company to the City Council for replacing the present arc lamps with incandescent units.

TERRYVILLE, CONN.—The City Council is considering plans for improvements in the lighting system on Main Street and on a number of side streets.

WATERBURY, CONN.—The Connecticut Light & Power Company is planning to install an underground conduit on West Main Street from Willow Street to Exchange Place.

Middle Atlantic States

BUFFALO, N. Y.—The Niagara, Lockport & Ontario Power Company has petitioned the Public Service Commission for approval of franchises granted to it by the Town Boards of Salamanca and Mansfield and for permission to extend its transmission and distribution lines to serve these towns.

HASTINGS, N. Y.—The Syracuse (N. Y.) Lighting Company, has applied for permission to extend its transmission system to West Monroe, Constantia and Cleveland.

LEON, N. Y.—The Olean Electric Light & Power Company, Olean, plans to build a substation in Leon, to cost about $35,000.

LOCKPORT, N. Y.—The Lockport Heat, Light & Power Company plans to build an addition to its plant at Elm and South Streets, to cost about $75,000.

NEW YORK, N. Y.—Bids will be received by E. J. O'Malley, Commissioner of Public Markets, Municipal Building, until June 16 for complete mechanical, electrical and refrigerating equipment for the Bronx Municipal Market, at Exterior and East 151st Streets.

NIAGARA FALLS, N. Y.—Electric power equipment will be installed in the proposed local plant of the Niacet Chemicals Corporation, recently organized by officials of the Union Carbide & Carbon Company, and the Roessler & Hassiacher Chemical Company, both of New York. The cost of the factory is estimated at $500,000.

OAKFIELD, N. Y.—The United States Gypsum Company plans to construct a power house at its local plant in connection with two new mill units, to cost about $100,000. Headquarters are at 205 West Monroe Street, Chicago.

SCHENECTADY, N. Y.—Electric franchises granted the Adirondack Power & Light Company in the towns of Kingsbury, Port Ann and Hadley and an electric and gas franchise in Queensbury have been approved by the Public Service Commission, and also the exercise of an electric franchise in Lincoln. The company also plans to erect a rural line about 3 miles from Canatosta to Clockville.

SYRACUSE, N. Y.—Permission has been granted the Syracuse Lighting Company to erect a high-tension transmission line in part of the village of Solvay. The proposed line is part of a tie line which the company is erecting to the east and south of Syracuse to improve its service in these sections. This line will carry 11,000 volts and will be about 9 miles long. The cost is estimated at $59,400. About 7,000 ft. of the line will be in Solvay.

VICTORY, N. Y. — The Public Service Commission has granted the Northern Cayuga Light & Power Corporation, Cato, permission to exercise an electric franchise in the towns of Victory and Conquest.

JERSEY CITY, N. J.—Steps have been taken by the West Newark Avenue Business Men's Association to secure an improved lighting system on that thoroughfare.

NUTLEY, N. J.—George La Monte & Son, 299 Kingsland Road, plan to build an addition to their power plant to cost about $25,000. The Fletcher-Thompson Company, 542 Fairfield Avenue, Bridgeport, Conn., is architect.

BRIDGEPORT, PA.—The King Manor Civic Association is negotiating with the Upper Merion Township Commissioners for the installation of an improved lighting system in the King Manor district.

YORK, PA.—An electrical equipment and repair shop will be installed at the proposed industrial high school at Beaver Street and College Avenue, to cost about $1,000,000. J. B. Hamme, City Bank Building, is architect. Henry Adams, Calvert Building, Baltimore, is engineer.

PORT DEPOSIT, MD.—The Public Service Commission has granted the Northern Maryland Electric Company, Baltimore, permission to acquire the distribution system of the Port Deposit Electric Company, and also to issue bonds and stocks to finance the purchase. Authority was also given the former company to erect transmission lines along various roads in Hartford and Cecil Counties.

WESTMINSTER, MD.—The Glen Rock (Pa.) Electric Light & Power Company has been granted a franchise to erect a number of transmission lines in Carroll County.

ASHLAND, VA.—The Spottsylvania Power Company, Fredericksburg, contemplates the erection of a transmission line from Ashland to Hanover Court House. The cost is estimated at $15,000.

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until June 2 for a quantity of incandescent lamp cord for various navy yards (Schedule 3791).

WASHINGTON, D. C.—Bids will be received by the United States Coast Guard Headquarters, Washington, until June 15 for two 90-hp. Diesel engines, etc., for electric generator sets and an oil engine for generator set for the Coast Guard cutter *Bear*.

North Central States

BATTLE CREEK, MICH.—Electric power equipment will be installed in the new addition to be erected by the Rich Steel Products Company, consisting of two units, to cost about $400,000.

DETROIT, MICH.—Application has been filed by the Fordson Power Company, Detroit, recently incorporated, for permission to condemn lands along the Huron River in connection with a proposed hydro-electric project to be built near Ypsilanti.

MONROE, MICH. — The Consolidated Paper Company plans to install electric power equipment in its proposed mill addition, to cost about $300,000.

BAINTERSTOWN, IND. — Plans are under way by the Interstate Public Service Corporation, Indianapolis, for the construction of a hydro-electric plant on the Elk-

hart River, near here. The cost of the initial unit is estimated at $200,000. E. J. Albrecht, 35 South Dearborn Street, Chicago, is consulting engineer.

NOBLESVILLE, IND.—The Middle West Utilities Company, Chicago, Ill., has acquired the property of the Noblesville Water & Light Company. Plans are under way for extensions and improvements to the local power plant.

ONTARIO, IND.—The property of the C. F. Cain Power & Light Company has been acquired by the Calumet Gas & Electric Company, Gary, which has secured permission to take over and consolidate the Indiana Electric Utilities, Angora; Hawk Brothers Milling Company, Mongo; Bass Lake (Ind.) Electric Light & Power Company, Nevada Mills (Ind.) Electric Company, and the Orland (Ind.) Light & Power Company. Extensions and improvements are contemplated by the Calumet company in this section.

ROCKFORD, ILL.—The Rockford Electric company contemplates the installation of a 1,960-hp. Babcock & Wilcox boiler with stoker during 1925. Adam Gschmidt is general manager.

BAYFIELD, WIS.—A special election will soon be called to vote on the proposal to sell the municipal electric light and water plants to the Northern Wisconsin Hydro-Electric Company, Port Wing. In case the properties are taken over by the company, the local plant will be used as an auxiliary to its Orienta Falls hydro-electric plant.

GREEN BAY, WIS.—The City Council is considering the installation of ornamental lamps on portions of West Walnut, West Mason, Dousman Streets and on Broadway from Fifth Street to Elmore Street.

HUDSON, WIS.—Plans are being considered by the Willow River Power Company to construct a dam and hydro-electric power plant on the Willow River at Burkhardt, to cost about $50,000.

MADISON, WIS.—The Wisconsin Power & Light Company, it is reported, is securing options on property in the towns of Orion and Buena Vista with a view of building a hydro-electric plant on the Wisconsin River in that vicinity. The properties of the Twin Bluffs Light & Power Company near the proposed site have been acquired by the Wisconsin company.

MILWAUKEE, WIS. — Condemnation proceedings have been started by the Milwaukee Electric Railway & Light Company in connection with its plan to erect a transmission line between its Lakeside power plant and Granville substation.

CANBY, MINN. — A petition has been presented to the City Council asking for the installation of an ornamental lighting system, consisting of thirty standards, in the business district.

LE SUEUR, MINN.—Bids will be received by the City Council until June 5 for alterations and improvements in the municipal power plant. Ralph W. Richardson, Zenith Building, St. Paul, is consulting engineer.

GREENE, IOWA.—Plans are being prepared by the Northeastern Iowa Power Company, Clermont, for the construction of a local power plant to cost about $50,000.

HARVEY, IOWA.—At an election held recently the proposal to grant the Iowa Utility Company a franchise to furnish electricity here was approved. The company is erecting a transmission line through Harvey and connecting up several towns in this vicinity.

SIOUX CITY, IOWA.—The Sioux City Gas & Electric Company is building a new generating station, the equipment to include three 1,100-hp. boilers and two 10,000-kw. turbines, to be ready for operation about July, 1925. W. J. Bertke is manager.

FULTON, MO.—Bids will be received by the State Eleemosynary Board, Jefferson City, until June 8, for an electric generator, engine, heater, air compressor, etc., for the state hospital No. 1 at Fulton. Also, at the same time, for a 400-hp. boiler, stoker, etc., for state hospital No. 4 at Farmington. E. E. Harper, 3031 Park Avenue, Kansas City, is consulting engineer.

OWENSBORO, MO.—A special election will be held June 2 to vote on the proposal to grant the Gasconade Power Company, a subsidiary of the Missouri Light & Power Company, Mexico, an electric franchise and a street-lighting contract. If the ordinances are approved the company proposes to purchase the local plant. The company is purchasing plants in neighboring towns and proposes to erect a transmission line from its central plant at Jefferson City, and later, when conditions demand it, to develop water power on the Gasconade or Osage River.

SILEX, MO.—The Silex Electric Light Company is installing a new 60-hp. oil-engine-driven generating unit to replace the present equipment. James Lindsay is president.

TROY, MO.—The East Missouri Power Company is now installing a 400-hp. Worthington oil engine and General Electric generator. L. A. Nickell is secretary and general manager.

ALEXANDER, N. D. — The Jennison Light & Power Company, Fairview, Mont., has been granted a franchise to supply electricity here and plans to erect a transmission line from Fairmont to Alexander and to erect a subtation here.

SYKESTON, N. D.—The City Council is considering calling an election to vote on the proposal to issue bonds for the erection of a transmission line to furnish electricity for local light and power service.

HOLDREDGE, NEB. — Improvements contemplated to the municipal electric system include the installation of twenty new street lamps and line extensions. J. P. McCollough is light and water commissioner.

GALENA, KAN.—The installation of an ornamental lighting system in the business district is under consideration by the City Council.

GREENSBURG, KAN.—A special election will be held on June 8 to vote on the proposal to issue $50,000 in bonds for extensions and improvements to the municipal electric plant.

LARNED, KAN.—Bids will be received by the State Board of Administration, Topeka, about June 15, for the construction of a power plant in Larned, to cost about $60,000. Charles D. Cuthbert, State House, Topeka, is architect.

LEAVENWORTH, KAN.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 19 for conduit and wiring and lighting fixtures at the United States court house, post office, etc., at Leavenworth, Kan. For details see Searchlight Section.

Southern States

BLACKSHEAR, GA. — Plans are being prepared by Day & Zimmermann, Inc., Sixteenth and Walnut Streets, Philadelphia, engineers, for the proposed local 300-kva. substation and a 11,000-volt transmission line to be erected by the Ware County Light & Power Company.

FAYETTEVILLE, GA.—Bids will be received by the City Council until June 1 for the installation of an electric lighting system, including 9½ miles of transmission lines. The J. B. McCrary Engineering Company, Atlanta, is engineer.

PAVO, GA.—Bonds to the amount of $10,000 have been voted, part of the fund to be used for the installation of an improved lighting system.

THOMASVILLE, GA. — The Atlantic Coast Line Railroad Company, Wilmington, N. C., contemplates the installation of an electrically operated turntable at its local terminal.

DANIA, FLA. — The installation of an ornamental lighting system in the downtown section, to cost about $15,000, is under consideration by the City Council.

GROVELAND, FLA.—The J. Ray Arnold Lumber Company plans to install electric power equipment in connection with the rebuilding its mill, recently damaged by fire with loss of about $700,000.

HOLLYWOOD, FLA. — The Hollywood Land & Water Company contemplate extensions to its power plant, to cost about $100,000.

JACKSONVILLE, FLA. — Plans have been authorized for the installation of an ornamental lighting system on the No. 3 county highway. W. E. Shedden is city engineer.

LIVE OAK, FLA.—The City Council is considering the advisability of building a municipal hydro-electric power plant on the Suwannee River, to cost about $90,000.

SARASOTA, FLA.—Bonds to the amount of $350,000 have been voted for extensions to the municipal electric light and power plant and lighting system.

TAMPA, FLA.—The Kreiss Potassium Phosphate Company contemplates the installation of electric power equipment at its proposed local plant for the production of fertilizer products. The cost is estimated at about $350,000.

CROSSVILLE, TENN. — The Tennessee Electric Power Company has petitioned the Railroad and Public Utilities Commission for approval of a franchise granted by the city of Crossville to construct and operate an electric light and power system here.

RIVES, TENN.—The Kentucky-Tennessee Light & Power Company has applied to the Railroad and Public Utilities Commission for approval of its franchise to furnish electrical service in Rives.

GULFPORT, MISS. — The Mississippi Power Company has applied for permission to build a hydro-electric power development on the Mississippi River, near Iuka, to develop a maximum of 200,000 hp.

MARKS, MISS. — The Home Light & Power Company contemplates installing a larger generating unit and extending its service to additional towns. D. M. Bradera is president and manager.

WINONA, MISS.—The municipal electric plant has been acquired by the Mississippi Power & Light Company, Pine Bluff, Ark. The company plans extensions to its transmission system in this section.

REAGAN, OKLA.—The Johnson County Power & Light Company is reported to be considering the construction of a hydro-electric power plant on Pennington Creek, near Ardmore project.

CAMERON, TEX. — The Cameron Oil Company contemplates the installation of electric equipment in connection with the rebuilding of its plant, recently damaged by fire with loss of about $500,000.

CANADIAN, TEX.—Bonds to the amount of $65,000 have been issued, the proceeds to be used for the installation of a municipal electric plant.

VICTORIA, TEX.—Bonds to the amount of $100,000 have been authorized, the proceeds to be used to establish a municipal electric plant.

Pacific and Mountain States

LOS ANGELES, CAL.—Bids will be received by the Board of County Supervisors, Hall of Records, until June 8, for an electric light and power system for the new laundry building at the Los Angeles general hospital, Mission Road.

LOS ANGELES, CAL.—The City Council has approved ordinances for the installation of ornamental lamps, using concrete standards, on Second, Third, Fourth, Fifth, Sixth, Seventh and Madden Avenues, between Slauson Avenue and Sixty-second Street; also on La Brea, Mansfield and Marne Avenues, between Twenty-first and Adams Streets.

LOS ANGELES, CAL. — The Southern California Edison Company is arranging an expansion program involving an expenditure of about $25,000,000 during 1925, of which $11,500,000, will be used for additional generating facilities and the remainder for transmission lines, substations, etc.

YOLO, CAL.—Plans have been adopted for an extension to the power and irrigation facilities of the Yolo Water & Power Company in Lake County, to cost about $1,000,000.

DOUGLAS, ARIZ. — The Phelps-Dodge Corporation, 99 John Street, New York City, plans to install electric power equipment in connection with extensions and improvements at its local Copper Queen reduction plant, to cost about $1,100,000.

WHIPPLE BARRACKS, ARIZ.—Separate bids will be received by the construction division, Veterans' Bureau, Washington, D. C., until June 16, for the installation of an automatic telephone system, and a fire-alarm system at the local barracks.

SWEETWATER, NEV. — Arrangements are being made by the Mono Mining Company to enlarge its Green Creek mining plant. The work will include the construction of a new 36-in. pipe line, installation of new transformers, etc.

Canada

FORD CITY, ONT.—Arrangements have been completed for carrying out local improvements for 1925, to cost about $387,000. The work will consist of laying sidewalks, building of watermains, sewers and the erection of street lamps.

PORT COLBORNE, ONT. — Plans are being prepared by the Hydro-Electric Power Commission of Ontario, Toronto, for extension of its transmission lines to supply electricity in Wainfield Township and summer colony along the lake shore, to cost about $35,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued April 28, 1925)

1,535,458. METHOD OF AND APPARATUS FOR ELECTROLYTIC REFINING; F. C. Frary, Oakmont, Pa. App. filed Nov. 5, 1923.

1,535,477. WELDING-MACHINE GUIDE; T. H. Kane, Youngstown, Ohio. App. filed Aug. 15, 1923.

1,535,486. ELECTRIC LAMP BULB; J. W. Lundy, San Francisco, Cal. App. filed Aug. 28, 1922. Containing a fluid or the like through which the light rays must pass.

1,535,490. GUIDE CHART FOR AUTOMATIC TELEPHONE INSTRUMENTS; M. L. Ong, Seattle, Wash. App. filed May 3, 1924.

1,535,498. SOLDERING IRON; W. C. Roe, Pittsburgh, Pa. App. filed March 14, 1919.

1,535,547. ELECTRIC RESISTOR FURNACE; T. A. Reid, Wilkinsburg, Pa. App. filed Aug. 28, 1922.

1,535,555. INDUSTRIAL AIR HEATER; F. Thornton, Jr., Wilkinsburg, Pa. App. filed Dec. 27, 1922.

1,535,559. PUSH-BUTTON SWITCH; H. G. Baxter, Baldwin, N. Y. App. filed Sept. 17, 1920.

1,535,577. APPARATUS FOR THE ELECTROLYTIC DEPOSITION OF METALS; App. filed Jan. 4, 1923.

1,535,578. CORD SUPPORT; O. A. Colby, Irwin, Pa. App. filed April 13, 1922. For portable electrically heated household appliances.

1,535,579. VERTICAL OVEN; O. A. Colby, Irwin, Pa. App. filed March 1, 1923. For heat-treating materials.

1,535,580. TOASTER; O. A. Colby, Irwin, Pa. App. filed April 6, 1923. Table toaster.

1,535,586. ARC WELDING; O. H. Eschholz, Wilkinsburg, Pa. App. filed June 30, 1921. Means for improving the physical characteristics of welds formed by arc deposition.

1,535,587, 1,535,588. ELECTRICAL MEASURING INSTRUMENT; R. D. Evans, Pittsburgh, Pa. App. filed July 30, 1920. Responsive to symmetrical components of unbalanced polyphase quantities.

1,535,589. ELECTRICAL MEASURING INSTRUMENT; R. D. Evans, Pittsburgh, Pa. App. filed July 30, 1920. Unbalanced-factor meters.

1,535,590. VOLT-AMPERE METER; R. D. Evans, Pittsburgh, Pa., and R. T. Pierce, Wilkinsburg, Pa. App. filed Oct. 20, 1921.

1,535,593. ELECTRICAL MEASURING DEVICE; C. Le G. Fortescue, Pittsburgh, Pa.; L. Warrington Chubb, Edgewood, Pa., and J. Slepian, Boston, Mass. App. filed Feb. 13, 1920. That shall indicate one symmetrical component of an unbalanced electrical quantity and the unbalance factor of a polyphase circuit.

1,535,594. ELECTRICAL MEASURING INSTRUMENT; C. Le G. Fortescue, Pittsburgh, Pa. App. filed Aug. 9, 1920. For measuring symmetrical components for unbalanced quantities.

1,535,595. NEGATIVE-PHASE-SEQUENCE BALANCER FOR POLYPHASE FURNACES; C. Le G. Fortescue, Pittsburgh, Pa. App. filed April 13, 1922.

1,535,605. AUTOMATIC WELDING MACHINE; W. H. Himes, Pittsburgh, Pa. App. filed Jan. 26, 1921.

1,535,608. HEATER FOR SCHREINER ROLLS; W. W. Johnson, Jr., Eddystone, Pa. App. filed Aug. 3, 1922.

1,535,618. FLEXIBLE ELECTROMAGNET; E. C. Mayer, Butte, Mont. App. filed Aug. 19, 1922.

1,535,622. BATTERY INDICATOR AND CUT-OUT; W. A. Morgan, Los Angeles, Cal. App. filed Feb. 5, 1921. For use in charging electric vehicles.

1,535,623. AUTOMATIC SUBSTATION; G. McL. Moss, Pittsburgh, Pa., and R. J. Wensley, Edgewood Park, Pa. App. filed July 10, 1918. For electric railway system.

1,535,624. ELECTRICAL SYSTEM; A. Nyman, Wilkinsburg, Pa. App. filed July 15, 1920. Measuring device adapted to be actuated in accordance with the various phase-sequence components of voltage, current, power and power factor of polyphase electric circuits.

1,535,627. TELEGRAPH SYSTEM; S. W. Perkins, Jacksonville, Fla. App. filed May 21, 1921. Transmitter system adapted for duplex and quadruplex telegraphy.

1,535,636. SAFETY INCLOSED SWITCH; E. H. Ullrich, New York, N. Y. App. filed Feb. 21, 1921. Service-entrance type.

1,535,638. ELECTRIC HEATING UNIT; J. G. Wallmann, Oakland, Cal. App. filed April 10, 1922. Suitable for bake ovens, driers and other heating devices.

1,535,639. MEANS FOR OVERCOMING LOAD INERTIA; C. A. M. Weber, Edgewood Park, Pa. App. filed Sept. 16, 1918.

1,535,674. APPARATUS FOR PRODUCING OSCILLATIONS; D. G. McCaa, Lancaster, Pa. App. filed Jan. 12, 1921. As employed in radio signaling.

1,535,693, 1,535,694. BINDING POST; O. A. Smith, East Cleveland, Ohio. App. filed May 2, 1922.

1,535,711. MANUFACTURE OF ELECTRIC CABLES; E. A. Bayles, Helsby, England. App. filed April 10, 1924.

1,535,733. TROLLEY-CONDUCTOR INSULATOR; S. S. Matthes, Mansfield, Ohio. App. filed Nov. 28, 1923.

1,535,745. TROLLEY-CONDUCTOR INSULATOR; S. S. Stolp, Mansfield, Ohio. App. filed Nov. 30, 1923.

1,535,751. THERMOSTATICALLY CONTROLLED IRON; W. J. Turenne, Danvers, Mass. App. filed Aug. 9, 1921.

1,535,766. CENTRIFUGAL MOTOR SWITCH; J. R. Cook, Lakewood, Ohio. App. filed Aug. 5, 1922.

1,535,774. SELF-STARTING SYNCHRONOUS MOTOR; T. Hibbard, Minneapolis, Minn. App. filed Nov. 7, 1919.

1,535,776. OIL-WELL HEATER; G. S. Hollister, Burkburnett, Tex. App. filed July 13, 1922.

1,535,778. ELECTRICAL SWITCH; J. A. Johnson, Niagara Falls, N. Y. App. filed July 18, 1919. High-potential disconnecting switch.

1,535,780. ELECTRICAL CONNECTION DEVICE; H. B. Jones, Evanston, Ill. App. filed Aug. 28, 1922. Plug-and-socket type.

1,535,807. SWITCH; L. F. Blume, Pittsfield, Mass. App. filed Jan. 13, 1923. For use in varying tap connections of a transformer winding.

1,535,829. ELECTRIC INCUBATOR HEATER; C. Hamilton, Garnett, Kansas. App. filed Feb. 28, 1924.

1,535,835. ELECTRIC SWITCH; J. D. Hilliard, Schenectady, N. Y. App. filed Nov. 20, 1922. Quick-break, oil type.

1,535,845. ELECTRIC LANTERN; T. Mee, Jr., Clinton, Ill. App. filed Oct. 15, 1923. Dry-cell type.

1,535,858. METAL AND METAL ALLOY FOR THERMOELECTRIC PURPOSES IN PARTICULAR FOR MAKING THERMOCOUPLES; W. Rohn, Hanau, Germany. App. filed May 14, 1920.

1,535,859. COIL FOR ELECTRICAL TRANSFORMERS; J. Roothaan, Hayes, England. App. filed Feb. 8, 1922. For high-voltage transformers.

1,535,873. ELECTRIC SWITCH; H. M. Stevens, Schenectady, N. Y. App. filed June 16, 1920. Double-throw type; comprising two separate but co-operating switch elements controlled in definite sequence by a single operating means.

1,535,877. REGULATING SYSTEM; L. W. Thompson, Schenectady, N. Y. App. filed April 23, 1924. For maintaining constant the speed of a motor supplied from a variable voltage source.

1,535,879. ELECTRICAL SYSTEM OF CONTROL; O. C. Traver, Schenectady, N. Y. App. filed March 22, 1920. For the control of circuit-interrupting devices.

1,535,883. ELECTRIC FURNACE CONTROL; H. A. Winne, Schenectady, N. Y. App. filed Nov. 23, 1921. For electric arc furnace.

1,535,901. ELECTRIC HEATER; W. Clark, Toronto, Ontario, Canada. App. filed Dec. 31, 1923. Portable type.

1,535,919. DOOR-RELEASE MECHANISM; J. W. Irwin and E. L. McDonald, San Francisco, Cal. App. filed Dec. 17, 1923.

1,535,924. ELECTRIC SWITCH; G. S. Leddick, Schenectady, N. Y. App. filed July 9, 1924. Motor-starting, multi-contact type.

1,535,933. SOLDERING IRON; J. Marinos, New York, N. Y. App. filed May 27, 1924.

1,535,979. METHOD OF AND APPARATUS FOR SYNCHRONIZATION; E. Belin, Paris, France. App. filed Feb. 7, 1925. As transmitting and recording cylinders.

1,535,984. CURRENT-COLLECTING DEVICE; H. P. Chandler, Mansfield, Ohio. App. filed April 9, 1924. Wheel type; for use with moving vehicles.

1,536,009. ELECTROPNEUMATIC CONTROL SYSTEM; L. Janisch, Berlin, Germany. App. filed May 12, 1923.

1,536,021. STEP-BY-STEP MOTOR; P. Van Santen Kolff, Philadelphia, Pa. App. filed March 11, 1922. For electrically transmitting signals.

1,536,024. CONNECTION PIECE FOR CABLE HEADS; A. Kvaal, Christiania, Norway. App. filed Dec. 13, 1924.

(Issued May 5, 1925)

1,536,049. ELECTRIC CIGAR LIGHTER; E. C. Allen, Rockford, Ill. App. filed Jan. 4, 1924.

1,536,064. PROCESS OF MAKING STORAGE-BATTERY PLATES; R. C. Benner, Bayside, N. Y., and J. H. Fink, Brooklyn, N. Y. App. filed June 6, 1922.

1,536,068. SWITCHBOARD PLUG; E. A. Bohlman, Chicago, Ill. App. filed Jan. 21, 1921.

1,536,077. DYNAMO-ELECTRIC MACHINE; F. Creedy, Ilkley, England. App. filed July 30, 1921. Relates to windings for dynamo which operate on fields of more than one pole.

1,536,082, 1,536,083. CIRCUIT-CONTINUING DEVICE; H. A. Douglas, Bronson, Mich. App. filed March 13, 1919, and Jan. 27, 1921.

1,536,086. ELECTRIC SWITCH; H. A. Douglas, Bronson, Mich. App. filed July 23, 1924. Push-and-pull type.

1,536,094. VAPOR-ELECTRIC HEATING EQUIPMENT; W. S. Hadaway, Jr., New Rochelle, N. Y. App. filed June 27, 1917.

1,536,097. MAXIMUM-DEMAND METER; J. Harris, Lafayette, Ind. App. filed Oct. 23, 1922.

1,536,149. CLIP STRUCTURE; W. Schmid, Coldwater, Mich. App. filed March 25, 1924.

1,536,159. SELF-WINDING CLOCK; M. A. Standow, Hartford, Conn. App. filed June 11, 1923.

1,536,179. MEANS FOR GENERATING OZONE; F. E. Hartman, Scottdale, Pa. App. filed Feb. 3, 1923.

1,536,191. ELECTRIC SIGNAL WIRING SYSTEM; J. H. Derby, New York, N. Y., and J. E. Bowden, Newark, N. J. App. filed June 3, 1919.

1,536,192. SELF-SUPERVISED ELECTRIC SYSTEM; J. H. Derby, New York, N. Y. App. filed March 12, 1921.

1,536,233. BALANCING MEANS FOR ELECTROLYTIC APPARATUS; R. D. Mershon, New York, N. Y. App. filed Oct. 4, 1919.

1,536,246. ASSEMBLY FOR CURLING IRONS; Le Roy Tronc, Chicago, Ill. App. filed March 7, 1924.

1,536,266, 1,536,267. UNTWISTING DEVICE; W. E. Putnam, Weston, Mass. App. filed June 2, 1922. For use on portable electrical instruments such as telephone instruments.

1,536,273. THERAPEUTIC DEVICE; Woldemar Schnee, New York, N. Y. App. filed March 20, 1924.

1,536,279. DYNAMO-ELECTRIC MACHINE; V. G. Apple, Dayton, Ohio. App. filed May 27, 1920. Provides a hollow rotor and locates the speed-responsive connecting means therein to economize space.

1,536,281. TERMINAL CONNECTOR; H. W. Batcheller, Worcester, Mass. App. filed Feb. 19, 1924.

1,536,294. ELECTRIC SWITCH; C. L. Hopkins, River Forest, Ill. App. filed Sept. 19, 1919. Pull-switch socket circuit is simultaneously broken at two points.

1,536,295. ELECTRICAL SWITCH; C. L. Hopkins, River Forest, Ill., and Walter F. Hinkle, Chicago, Ill. App. filed Sept. 22, 1919. Two breaks are made in the circuit simultaneously.

1,536,318. RECEPTACLE FOR ELECTRICAL CONNECTING AND SUPPORTING DEVICES; E. Cantelo White, New York, N. Y. App. filed March 26, 1921.

1,536,321. VARIABLE-CONTACT DEVICE; W. O. Amsler, Pittsburgh, Pa. App. filed April 12, 1923. For varying resistance or inductance in circuits.

1,536,328. COMMUTATOR; L. Caruso, Irvington, N. J. App. filed March 31, 1923. For use in small motors operating at comparatively low speeds.

1,536,329. BRUSH RIGGING; L. Caruso, Irvington, N. J. App. filed June 9, 1923. In toy electrical devices.

1,536,332. LAMP SOCKET FOR CHRISTMAS-TREE LIGHTING; H. M. Rosendal Dam, Astoria, N. Y. App. filed Nov. 22, 1924.

1,536,336. CIRCUIT INTERRUPTER; G. Fussner, Menominee, Mich. App. filed June 18, 1920. Electromagnetic type.

1,536,355. SWITCH FOR CONTROLLING ELECTRIC CIRCUITS; W. J. Pritchett, Sydney, New South Wales, Australia. App. filed Sept. 3, 1921.

1,536,419. PROCESS OF EFFECTING ORGANIC REACTIONS; A. W. Burwell, Poughkeepsie, N. Y. App. filed Jan. 26, 1922. By electrolytic method.

1,536,439. MERCURY SWITCH; R. L. Knutsson, Rockford, Ill. App. filed Jan. 7, 1924.

1,536,441. SNAP-SWITCH TERMINAL; H. E. Leppert, New Britain, Conn. App. filed Jan. 8, 1921.

1,536,442. ELECTRIC SWITCH CLIP; H. E. Leppert, New Britain, Conn. App. filed Nov. 27, 1923. For a knife-blade switch.

1,536,450. MAGNETO; E. B. Nowosielski, Bloomfield, N. J. App. filed April 19, 1921.

1,536,464. TELEPHONE SYSTEM; S. B. Williams, Jr., Brooklyn, N. Y. App. filed June 6, 1922.

Financial and Corporate

Profit Taking Appears

Public Utility Stocks Rise to New High Levels, from Which Some Lose Ground

WHILE a majority of the utility stocks closed the week with substantial gains, an important change occurred in the direction of prices during the week. Record high prices for all time were made at the beginning of the week, but on reaching these levels stocks in many groups became less active. Profits were taken. Liquidation tended to check the abnormal forward advance that had been under way a week ago.

American Water Works & Electric Company's stock on the big board established a new high at 63½, but afterward reacted to about 59. At the peak this stock was selling on a level equivalent to more than 315 for the old shares that sold last year as low as 40. Southeastern Power & Light likewise in reaching 107 was selling last week at a level equivalent to 214 for the old Alabama Traction, Light & Power stock, which could have been bought last year around 30 at one time. Southeastern after touching 107, however, fell back below 90 before buying set in again. It should be added that the moves in this stock are made without the appearance of very large blocks on the market. Virginia Railway & Power touched 119¾, as compared with its 1924 low of 36, but afterward sold off again. North American Company's common stock strengthened on publication of the company's good balance sheet, the price moving forward to 50.

Interest in Commonwealth Power Corporation's stock has been intensified by the announcement of a four-to-one split-up and the acquisition of the Tennessee Electric Power Company. While profit taking afterward brought the stock back to 163, Commonwealth at one time last week got as high as 173 and the warrants as high as 86½. Tennessee naturally has not moved relatively as much as Commonwealth, since it is now next to certain that Tennessee will be taken into the Commonwealth group. Electric Power & Light continues active on the big board and last week at one time touched 37, a new high price.

New Capital Issues

The National Public Service Corporation during the past week floated a four-and-a-half-million-dollar issue in the form of thirty-year 6½ per cent sinking-fund collateral-trust gold bonds. These bonds, which constitute the only funded debt of the corporation, were priced at 97½ and accrued interest to yield about 6.70 per cent. The proceeds, together with the funds derived from the sale of additional shares of preferred and common stock, will be used for the purchase of more than 90 per cent of the common stock of the Municipal Service Company and for other corporate purposes.

Another sizable offering was made by the Minnesota Power & Light Company of first and refunding mortgage gold bonds, the price being 97 and interest, yielding about 5.20 per cent. These bonds mature in 1955.

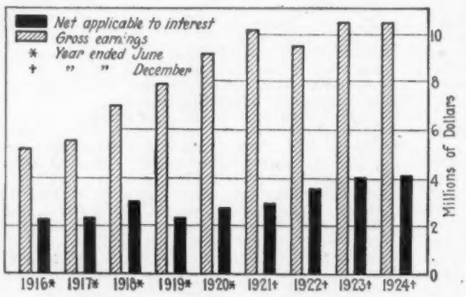
The Southern Pennsylvania Power Company was represented with an issue of first mortgage and collateral trust 6 per cent bonds amounting to $1,200,000, priced at 98 and accrued interest to yield about 6.15 per cent. The Louisville Gas & Electric Company offered 450,000 shares of class A common stock at $26 per share.

Gould Sells Virginia Railway & Power

Stone & Webster Purchase Central-Station Properties Whose Territory Embraces Richmond, Norfolk, Portsmouth and Surrounding Municipalities

BY PAUL WILLARD GARRETT

FROM a low price last year of 36 on the New York Stock Exchange to a recent high of 119¾ is the record that stands to the credit of the common stock of the Virginia Railway & Power Company. The spectacular advance in this stock, which for so long previously had been quiet in utility transactions, was stimulated, it now appears, primarily by negotiations for the purchase of control. Frank Jay Gould long has been willing to sell the properties at a price, but, although numerous bids have been made, the passing of Gould control did not come until last week, when an arrangement was made to dispose of Virginia Railway & Power to the Stone & Webster group.



ANNUAL GROSS EARNINGS OF VIRGINIA RAILWAY & POWER COMPANY

Virginia Railway & Power was not incorporated until 1909, before which time the properties had been operated since 1904 by receivers for what was then known as the Virginia Passenger & Power Company. The new company in 1909 acquired control of the Richmond & Petersburg Electric Company and two years later absorbed the Norfolk & Portsmouth Traction Company, which carried control of the City Gas Company of Norfolk as well as the lease of the Norfolk Railway & Light Company for ninety-nine years. Other properties were acquired in later years.

As now organized, the Virginia Railway & Power Company performs without competition virtually the entire electric light and power and traction business in Richmond, Norfolk, Portsmouth, Petersburg and surrounding territories and, through stock ownership and control, the gas business of Norfolk.

As the name indicates, the operations of the Virginia Railway & Power Company are divided between the traction and power fields, but it is possible that the new management in time may make a separation of the two types of services. A segregation of the 1924 revenues shows that with operating revenues totaling $10,454,047, or slightly under those for the year before, the light and power department contributed $5,705,003 and the railway department $4,749,043. The light and power department did better than in the year before, but these gains were more than offset by a shrinkage in railway revenues. However, the difference in gross revenues for the two years was unimportant. Furthermore, while the gross revenue from operations was somewhat below that for 1923, the gross income from all sources was higher than in 1923.

Virginia Railway & Power's capital as of December 31, 1924, was about evenly divided between stocks and bonds. Specifically, the company had $20,937,590 in stocks as against $23,107,000 in bonds, including certain bonds held in the sinking fund and treasury. Preferred stock (including scrip) is outstanding to the amount of $8,987,090 and common to the amount of $11,950,500. The most important issue of bonds is the $14,956,000 issue of Virginia Railway & Power Company 5's of 1934.

From gross earnings of $10,454,047 for 1924 Virginia Railway & Power deducted $6,549,588 for operating expenses, maintenance, taxes and rentals, leaving net earnings of $3,904,459. Other income swelled these earnings by $292,095 to $4,196,454. Annual interest charges for the year aggregated $986,931. In other words, Virginia Railway & Power last year covered its interest charges four and two-tenths times. While the company pays dividends regularly on its preferred shares, it pays nothing on the common.

Reported net earnings applicable to interest charges have grown from $2,215,872 for the year ended June 30, 1916, to $4,196,553 for the year ended December 31, 1924. What earnings on the common stock have been is not easy to say since the managemnt has adopted the policy of plowing money back into the property in various ways rather than to report full amounts on the stock.

Associated Gas & Electric Gets Manila Electric Corporation

The Associated Gas & Electric Company announces the acquisition of a substantial majority of the stock of the Manila Electric Corporation as a result of the exchange offer made to Manila Electric Corporation stockholders on May 2. Under the terms of this offer the Associated will issue in exchange its 6 per cent interest-bearing convertible debenture obligations at the rate of $50 principal amount for each share of stock of the Manila Corporation.

The directors of the Associated have just authorized the issuance of $14,000,000 of secured gold bonds, 6 per cent, series of 1925, maturing in thirty years.

Pennsylvania Utilities to Consolidate

The Metropolitan Edison Company of Reading, Pa., largest subsidiary of the General Gas & Electric Corporation, has filed a petition with the Public Service Commission asking for approval of the merger of the Hanover Power Company, the Gettysburg Electric Company and the Cumberland Valley Light & Power Company with its own properties. The stock of these companies, connected with the General Gas & Electric Corporation's Pennsylvania-New Jersey interconnected system, is owned at the present time by the Metropolitan company. The three utilities participating in the merger serve a large population in York, Cumberland and Adams Counties, Pennsylvania.

Dividends Declared

During the past week the following quarterly dividends were announced by electric light and power companies and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
Cons. Gas, Elec. Lt. & Pwr. of Balto.	50c.	July 1
Cons. Gas. Elec. Lt. & Pwr. of Balto. pf. A	2	July 1
Cons. Gas, Elec. Lt. & Pwr. of Balto, pf. B	1¾	July 1
Cons. Gas, Elec. Lt. & Pwr. of Balto. pf. C	1¾	July 1
Cities Service, com. (monthly)	½	July 1
Cities Service, com. (in com. stock)	½	July 1
Cities Service, pf. and pf. B (m'thly)	½	July 1
Grafton Co. Elec. Lt. & Pwr., pf.	2	June 1
Kentucky Hydro Elec., pf.	1¾	June 30
Mascoma Lt. & Pwr., com	2	June 1
Mascoma Lt. & Pwr., pf.	1¾	June 1
Massachusetts Lighting Cos., com.	75c.	June 30
National Power & Light, pf.	$1.75	July 1
National Public Service, class A	40c.	June 15
Northern Texas Electric, com.	2	June 1
Pennsylvania-Ohio Elec., pf.	1¾	June 1
West Penn, com.	$1	June 30
General Electric, com	$2	July 15
General Electric, special	15c.	July 15

Annual Reports of Electric Light and Power Companies

The 1924 annual report of the National Power & Light Company, made public this week, shows gross earnings for subsidiaries of $22,886,444, an increase of 9½ per cent over the previous year, and net earnings of $8,063,330, an increase of 15 per cent. After the deduction of all interest charges and preferred dividends and the appropriation of $1,978,609 for renewals and replacements (depreciation) by the subsidiary companies, the balance applicable to the payment of interest on the National Power & Light Company's income bonds and dividends on its preferred stock and common stock was $2,841,530. Interest at the rate of 7 per cent on the company's income bonds and dividends at the rate of $7 per share on its preferred stock were paid during the year, leaving a balance applicable to the common stock of $1,975,957, equal to $16.19 per share on the 122,078 shares outstanding at the end of the year. The company's balance sheet at December 31, 1924, shows total current assets of $2,477,102 and total current liabilities of $1,879,097. Reserves aggregated $405,533 and surplus amounted to $1,754,996. Of the total gross earnings of subsidiaries, 50 per cent was derived from electric power and light service, 38 per cent from railway service and 12 per cent from manufactured gas and miscellaneous service. The subsidiary companies reported at the end of the year 212,933 consumers, of whom 158,463 were electric consumers and 54,470 were gas consumers. Property owned by the subsidiary companies includes electric generating plants having an installed capacity of 178,550 kw., including 20,000 kw. under construction.

The preliminary report of the Western Power Corporation and subsidiaries for the year ended December 31, 1924, shows a net income, after taxes and charges, of $1,339,790 as against $1,480,234 in 1923. After deducting preferred-dividend requirements for the subsidiaries and the Western Power Corporation, this is the equivalent of a return of $1.21 a share on the common. The balance sheet as of December 31, 1924, shows total assets of $96,402,196, reserves of $3,819,935 and profit and loss surplus of $5,575,538.

The directors of the Indiana Hydro-Electric Company have made public their report for the year ending December 31, 1924. The gross earnings were $170,211.49. The operating expenses, including taxes, were $64,057.50. Miscellaneous income was $948.63 and interest on the funded debt $87,499.99. There was charged to general interest and amortization of discount $10,336.86, leaving a net income of $9,265.77 for the year.

The Portland (Ore.) Electric Power Company for the twelve months ended December 31, 1924, reports gross earnings of $10,841,618 compared with $10,825,300 in 1923 and net income after taxes and interest of $2,062,385 against $2,107,549 during the previous year. Light and power customers at the end of the year numbered 77,032, an increase of 6,817 new customers during 1924. Sales of kilowatt-hours totaled 239,867,685, a substantial increase over 1923 when 220,491,126 kw.-hr. were sold.

Company Reports

The following reports were issued during the past week by electric light and power companies for the month of April:

Name of Company	Gross Earnings for April 1925	1924
Alabama Power	$841,411	$699,498
Central Maine Power Co. System	328,304	311,751
Cities Service	1,869,241	1,791,322
Columbia Gas & Electric	2,917,250	2,656,980
Electric Pwr. & Lt. subsidiaries*	3,037,539	2,991,495
Grafton Co. Electric Lt. & Pwr.	17,366	16,590
Massachusetts Lighting Cos.	288,009	266,434
Newport News & Hampton Ry. Gas & Electric	157,332	149,101
Republic Railway & Light	918,813	882,751
Staten Island Edison and Affiliated Cos.	235,219	222,165
Washington Water Power	420,899	411,177
York Utilities	15,119	16,781

*March

Hurley Machine to Vote Increase in Stock.—Directors of the Hurley Machine Company, Chicago, have called a special meeting of stockholders for June 2 to vote on a proposal to increase the capital stock from 200,000 shares of no par value to 300,000 no-par-value shares.

Commonwealth Power to Increase Capital.—As a step in its plan for the acquisition of the Tennessee Electric Power Company outlined in last week's issue of the ELECTRICAL WORLD, the Commonwealth Power Corporation has called a stockholders' meeting for June 23 to authorize an increase in the preferred stock ($100 par) from 300,000 shares to 500,000 shares, an increase in the common stock from 300,000 shares (no par) to 2,000,000 shares, and the issuance of four shares of new common in exchange for each share of present common.

General Electric Stockholders' Meeting.—The stockholders of the General Electric Company at their meeting on May 12 voted to increase the capital stock of the company from the present amount to $220,000,000, consisting of 1,850,000 shares of common stock of the par value of $100 each and 3,500,000 shares of special stock of the par value of $10 each, to the amount of $240,000,000, consisting of 1,850,000 shares of common stock of the par value of $100 each and 5,500,000 shares of special stock of the par value of $10 each, an increase in such special stock by the amount of 2,000,000 shares.

Increase in Stock Voted.—The board of directors of the Public Service Company of Northern Illinois recently voted an increase of 20 per cent in the outstanding shares of the company. This will be in the form of additional common stock without par value and will amount to 76,491 shares. Holders of 6 per cent and 7 per cent preferred stock and of the common stock of par value and common stock without par value will have the privilege of subscribing to the shares to be offered at $100 a share. The stockholders as of record at 5 p.m., July 3, 1925, will have the right of subscription. The date of the right to subscribe will expire August 1, 1925.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stocks is $100.)

Companies	Bid Price Saturday, May 23	Low 1925	High 1925
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	104	98	104
Appalachian Power, 7 per cent	97½	92	100
Arkansas Light & Power 7 per cent	96	92	98
Asheville Power & Light 7 per cent	*a* 99	99	100
Central Illinois Public Service 6 per cent	90	84	93
Colorado Power 7 per cent	94	93	98
Connecticut Light & Power 7 per cent	106	105	110
Consumers' Power 6 per cent	92	90	93½
Dayton Power & Light 6 per cent	94	88	100
Duquesne Light 7 per cent	*a* 109½	105	110
Eastern Texas Electric 6 per cent	100	100	105
Empire District Electric 6 per cent	78	78	85
Fort Worth Power & Light 7 per cent	*a* 101	101	102
Great Western Power 7 per cent	98	...	...
Illinois Northern Utilities 6 per cent	88	82	92
Illinois Power & Light 7 per cent	95	92½	98
Kansas Gas & Electric 7 per cent	*a* 100	99	100
Long Island Lighting 7 per cent	102	100	105
Minnesota Power & Light 7 per cent	*a* 98½	98½	100
Mississippi River Power 6 per cent	90	87½	92
Nebraska Power 7 per cent	*a* 100	100	101
Niagara Falls Power 7 per cent—25	28½	28	29
Niagara, Lockport & Ont. Power 7 per cent	110	101½	110
Northern States Power 7 per cent	96	95	100
Ohio Public Service 7 per cent	97½	97	100
Pacific Gas & Electric 6 per cent	95	92	97
Pacific Power & Light 7 per cent	*a* 99	99	100
Penn-Ohio Power & Light 7 per cent	94	91	100
Pennsylvania Power & Light $7—no par	*a* 103	103	104
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	37½	37½	45
Southern California Edison 8 per cent	120	115	122
Southern California Edison 7 per cent	106	105	107½
Southern California Edison 6 per cent	92½	90	92½
Tennessee Electric Power, 6 per cent	82	80	84
Texas Power & Light 7 per cent	*a* 100½	100	102
Utah Power & Light 7 per cent	*a* 99½	99½	101
Western States Gas & Electric 7 per cent	89	82	89
Yadkin River Power, 7 per cent	*a* 99½	99½	101
Holding Companies			
American Gas & Electric 6 per cent—no par	89	85	90
American Light & Traction	98½	93	100
American Power & Light 6 per cent	88	84	90
American Public Service 7 per cent	91	88	94
American Public Utilities 7 per cent	89	87	95
American Water Works & Electric 7 per cent	103	100	103
Associated Gas & Electric 7 per cent—1 per cent extra—no par	*a* 52	...	...
Associated Gas & Electric—$6—no par	84	...	...
Carolina Power & Light 7 per cent	103½	100	105
Central Indiana Power 7 per cent	89	88	95
Cities Service 6 per cent	81	80	83
Commonwealth Power 6 per cent	84	80	85½
Consolidated Gas 6 per cent—50	*a* 59¼	...	...
Continental Gas & Electric 7 per cent pr. pf.	90	89	95
Electric Bond & Share 6 per cent	*a* 103	103	104
General Gas & Electric—$8—no par	111	104½	114
*Middle West Utilities 7 per cent	96	91½	98½
National Power & Light—$7—no par	100	95	100
North American 6 per cent—50	*a* 49½	46½	49½
Public Service Corp. of N. J. 7 per cent	101½	99	102
Public Service Corp. of N. J. 8 per cent	*a* 114	109	114
Standard Gas & Electric 8 per cent—50	*a* 54½	50½	54½
†United Gas Improvement—50	58½	56½	58½
United Light & Power—$6.50—no par	86	83	89
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	79	31	79
Appalachian Power—no par	77½	70	83
Arkansas Light & Power	95	65	95
Brooklyn Edison	*a* 137½	120½	140½
Buffalo General Electric—no par (new)	66	44	69
*Commonwealth Edison	135½	130½	139
§Consolidated Gas, Electric Light & Power	42	32	44
Dayton Power & Light	420	180	460
Detroit Edison	*a* 123½	110	125½
|| Edison Electric Illuminating of Boston	211	200	213
*Kentucky Hydro-Electric	92½	85½	92½
Long Island Lighting (new)	80	60	85
Mississippi River Power	48	37	48
Montana Power	*a* 87½	64	87½
Niagara Falls Power—no par	69	45½	69
Niagara, Lockport & Ontario Power—no par	65	60	73
Northern Ohio Power	10½	5	13½
Northern States Power	116	103	118
North Texas Electric	40	40	70
Pacific Gas & Electric	110½	102½	110½
‡Penn Central Light & Power—no par	67	60	67
§Pennsylvania Water & Power	137½	126½	144½
‡Philadelphia Electric—25	38	37½	47½
Public Service Co. of Northern Illinois	114	97	116
Puget Sound Power & Light	57	49	61
Southern California Edison	107½	102	107½
Tennessee Electric Power—no par	65	47	67
Virginia Power	65	65	92
Virginia Railway & Power	*a* 113	64½	119½
West Penn. Co.	*a* 135	105	145
Holding Companies			
American Gas & Electric—no par	81	70	85
American Light & Traction	167	139	172
American Power & Light	66	52	67
American Public Utilities	78	70	85
American Water Works & Electric	*a* 60	34½	63½
Associated Gas & Electric, Class A	*a* 34½	...	...
Carolina Power & Light—no par	400	290	425
Cities Service (new)	37	34	43
Columbia Gas & Electric—no par	*a* 67½	45½	69½
Commonwealth Power Corp.—no par	160	106	168
Consolidated Gas—no par	*a* 89½	74½	89½
Continental Gas & Electric	84	77	90
Electric Bond & Share Sec. Corp.	*a* 73	73	80
Electric Power & Light	*a* 33	17½	37
Federal Light and Traction	*a* 30½	30	33½
General Gas & Electric	97	72	102
Lehigh Power Securities—no par	126	82	131
*Middle West Utilities—no par	94½	82½	102½
National Power & Light—no par	291	185	291
North American—10	*a* 49½	41½	50
Philadelphia Co.—50	*a* 57	51½	59½
Power Securities—no par	18	...	...
Public Service Corp. of N. J.—no par	*a* 73	62½	74
Standard Gas & Electric—no par	*a* 52½	40½	54½
United Gas & Electric (Conn.)—no par	42	26	45
BONDS			
Operating Companies			
Adirondack Power & Light	6s 1950	105½	102½ 105½
Alabama Power	5s 1946	99	96 100
Appalachian Power	5s 1941	98½	96 99½
Brooklyn Edison	5s 1949	102½	99½ 103
	6s 1930	105	104 105½
Cleveland Electric Illuminating	5s 1939	101½	100 101½
Commonwealth Edison	5s 1943	101	99½ 102
	5s 1953	99½	98½ 101
§Consol. Gas, Elec. Lt. & Pwr.	4½s 1935	97½	93½ 97½
	6s 1949	107½	104½ 107½
Consumers' Power	5s 1936	99½	99 100½
	5s 1952	98½	90½ 98½
Detroit Edison	5s 1933	101½	99½ 102½
Duquesne Light	6s 1949	106	104½ 107
Great Western Power	5s 1946	98½	95 98½
Kansas City Power & Light	5s 1952	100	95½ 100
Mississippi River Power	5s 1951	99	96½ 100
Montana Power	5s 1943	100½	97½ 100½
New England Power	5s 1951	101½	100½ 102
New York Edison	6½s 1941	115½	112 115½
Niagara Falls Power	6s 1932	105½	103½ 106
Northern States Power	5s 1941	98½	93 99½
	6s 1941	105	103 107½
Ohio Power	7s 1951	106½	106½ 107½
Pacific Gas & Electric	5s 1942	97½	93½ 98
Pennsylvania Water & Power	5s 1940	100½	99½ 102
‡Philadelphia Electric	5s 1966	102½	100½ 102½
	5½s 1947	106½	103½ 106½
	6s 1941	107½	106. 107½
Portland Electric Power	6s 1947	100	96½ 100
Southern California Edison	5s 1939	100	99½ 101
	6s 1944	104	102½ 104½
Tennessee Electric Power	6s 1947	102½	99½ 104
Texas Power & Light	5s 1937	98½	97 99½
Toledo Edison	7s 1941	109½	108½ 110
Utah Power & Light	5s 1944	97½	91 97½
Holding Companies			
Alabama Traction, Light & Power	5s 1962	93½	86 95
American Gas & Electric	6s 2014	96½	96½ 97½
American Power & Light	6s 2016	96	94 96½
Amer. Water Works & Electric	5s 1934	97½	92½ 97½
Associated Gas & Electric	6½s 1954	*a* 104	... ...
Central Indiana Power	6s 1947	98	95½ 98½
Commonwealth Power	6s 1947	101½	97½ 101½
Consolidated Cities Lt., Pwr. & Tr.	5s 1962	80½	75½ 80½
Illinois Power & Light	6s 1953	100½	100½ 102
United Light & Railways	5s 1932	96½	93½ 97
	6s 1952	99	95½ 100
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing		107½	103½ 107½
*National Carbon		125	120 125
Worthington Pump & Machinery A.		*a* 81½	79 88
COMMON STOCKS			
Allis-Chalmers Manufacturing		*a* 81½	71½ 86½
American Bosch Magneto—no par		*a* 31½	26½ 54½
Electric Storage Battery—no par		*c* 65½	60½ 70½
General Electric		*a* 283½	227½ 320
General Electric—10		*a* 11½	11 11½
*Hurley Machine—no par		50½	41½ 56
†Wagner Electric		39	26½ 50
Westinghouse Electric & Manufacturing—50		*a* 72½	66½ 84
Worthington Pump & Machinery		*a* 40½	36½ 79½
BONDS			
General Electric	3½s 1942	84	83 84
	5s 1952	105½	101½ 105½
Robbins & Myers	7s 1952	64½	64½ 73½
Wagner Electric Mfg.	7s	101	100½ 102
Western Electric	5s 1944	100½	98 101
Westinghouse Electric & Mfg.	7s 1931	107½	106½ 108½

*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. || Boston Stock Exchange §Baltimore Stock Exchange.
a Bid price, low and high, Monday, May 25.